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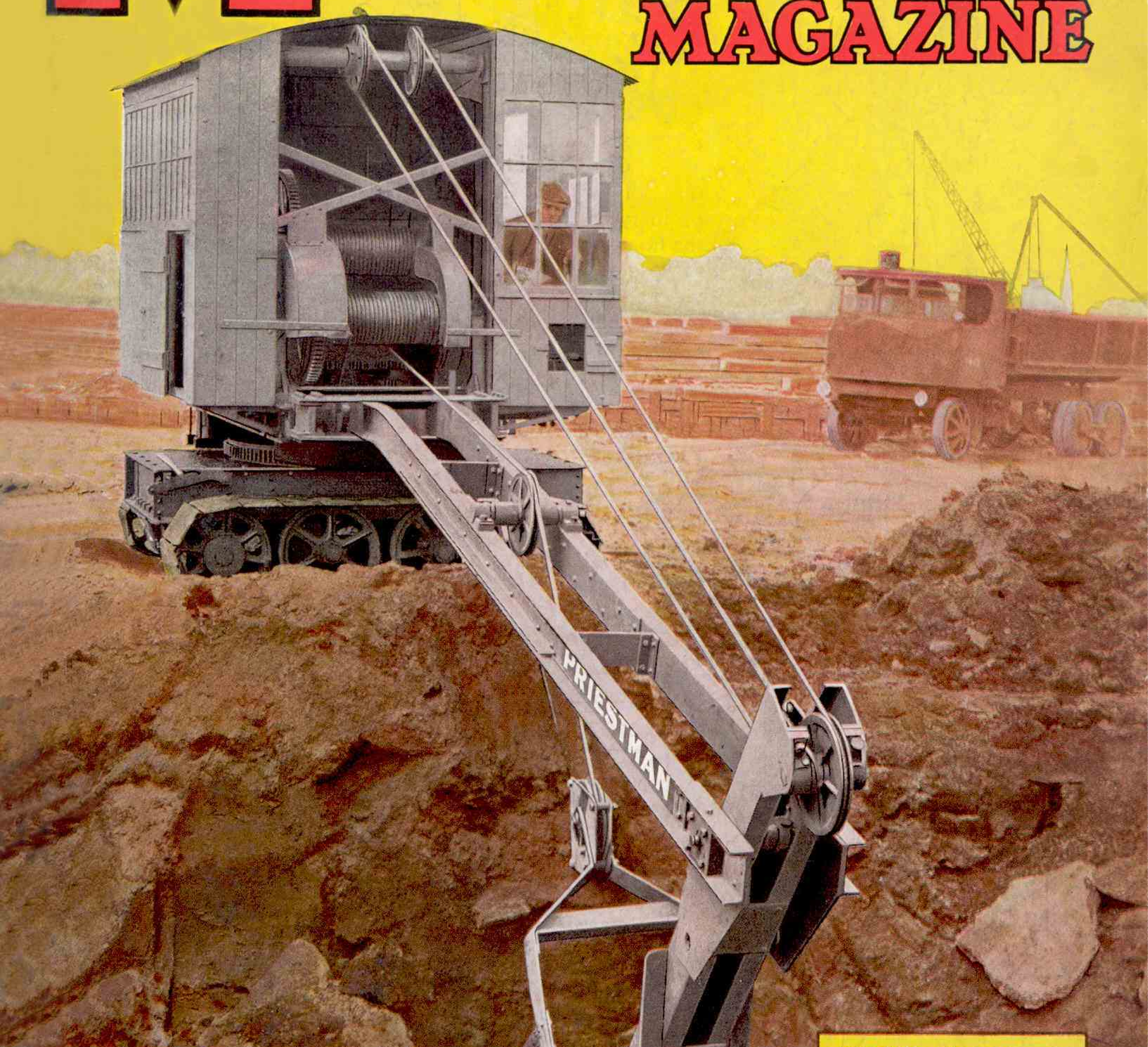
MECCANO MAGAZINE



WONDERFUL EXCAVATORS
(see page 98)

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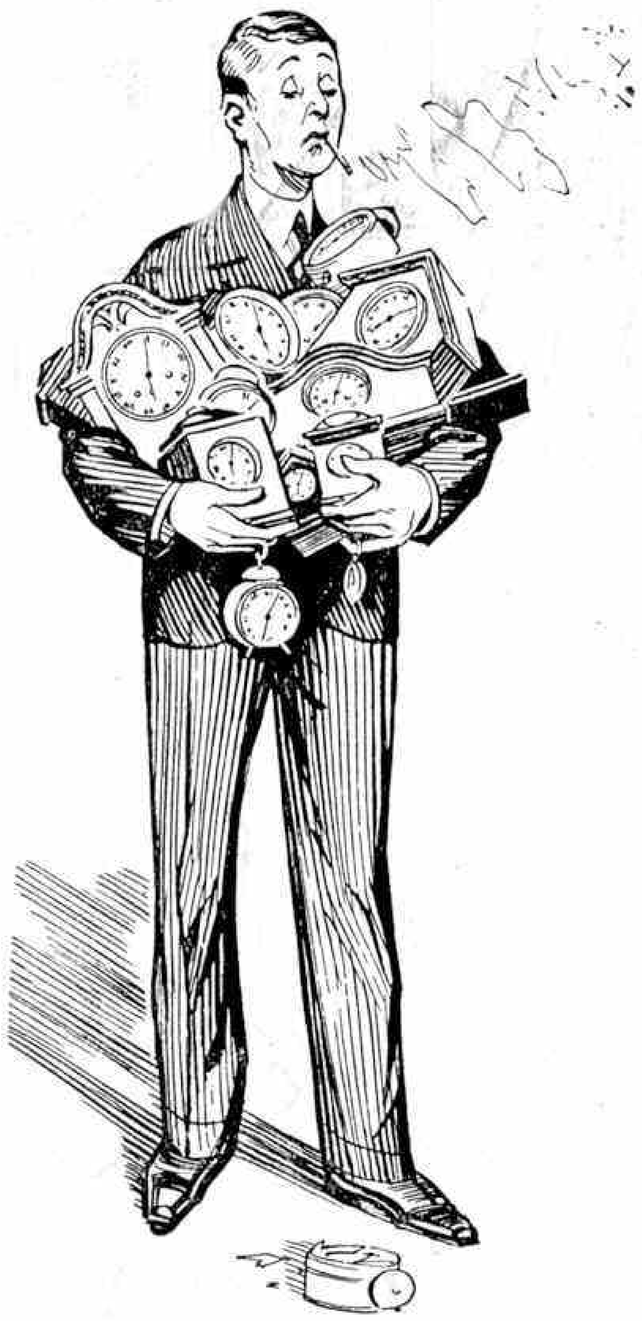

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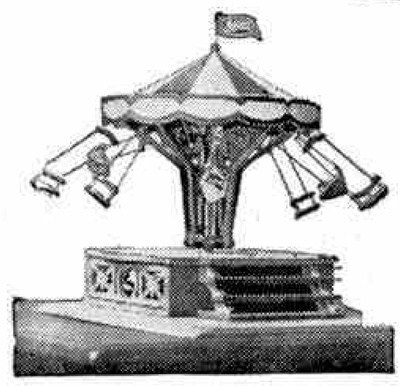

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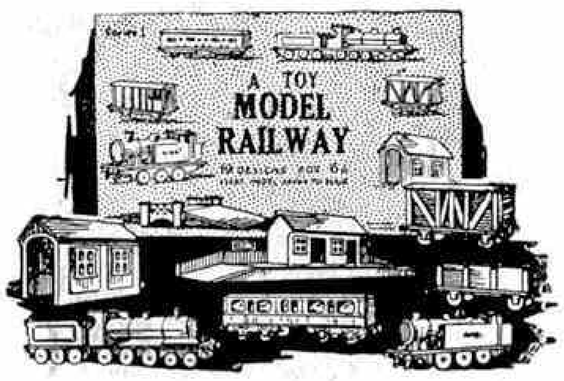

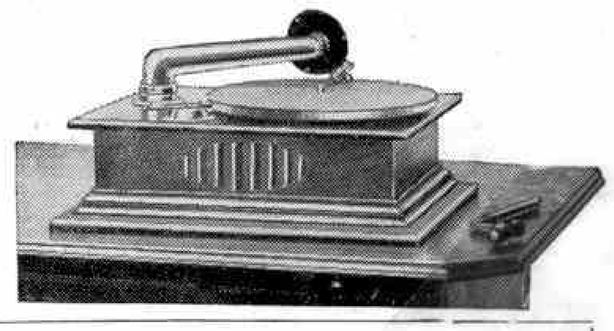

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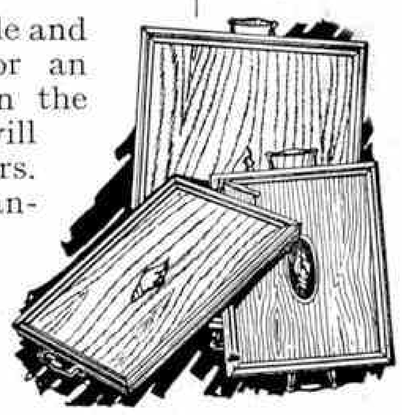

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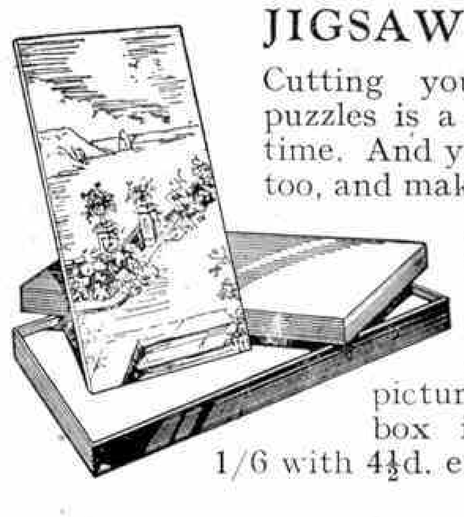

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HOBBIES

BRITISH FRETWORK OUTFITS

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With the Editor

Marshal Joffre

The death of Marshal Joffre on 3rd January removed the last of the three outstanding military figures of the War, Earl Haig having died on 29th January, 1928, and Marshal Foch on 20th March, 1929.

Opinions differ, and perhaps always will differ, as to the place of Joffre among the military leaders of the world, but no one can deny that he played a great part in the long and terrible struggle that ended in dearly-bought victory for the Allies. He was Commander-in-Chief of the French armies from the outbreak of war to the end of 1916, and throughout this period he had the unswerving confidence of his troops. His unruffled calm in the face of the disasters of the first days of the War went far towards stemming the tide of defeat and enabling the Allied armies to recover from the terrific shock of the German onslaught. Nobody could feel panic in the presence of Joffre. Anxious and nerve-strained Generals who visited him left full of confidence, feeling that a great load had been lifted from their shoulders. Foch once said that they used to call Joffre the life-buoy that could not be harmed by wind or waves.

Joffre must be held largely responsible for the plan of campaign that so nearly proved fatal; but equally he must be credited with having fought the Battle of the Marne, which finally upset the German programme, and may be said to have laid the foundation of the Allied victory four years later.

When war broke out, the French plan of campaign involved an intensely concentrated offensive in Alsace and Lorraine. It practically ignored the possibility of a great German sweep through Belgium, and thus left the north-eastern frontier open to the enemy. A further defect of the scheme was that it completely underestimated the number of German divisions that could be put into the field at the very commencement of hostilities. The French had three armies along the Franco-German frontier and only one east of the Meuse watching the Belgian frontier; while a fifth army was in reserve. Even when news arrived of the advance through Belgium, Joffre seemed unable to realise the enormous extent of the German sweep. He clung obstinately to his original scheme in the face of plain and rapidly accumulating evidence that the Germans were throwing their main strength into the attack from the north. The enemy, he believed, would not cross the Meuse. On 14th August the French First and Second Armies crossed the frontier south of Metz; a day later Joffre learned that 200,000 Germans had crossed the Meuse.

The late Marshal Joffre.

Calmness in a Critical Period

Realisation of the true state of affairs was now forced upon Joffre, and he had to readjust his plans with the utmost rapidity. It was during the intensely critical period that followed that his imperturbable calmness was of such value. He maintained a firm grip upon his armies, and in spite of mistakes and setbacks, many of which were due to persistent underestimation of the German strength, he never lost control of the situation. The British Expeditionary Force and the French Fifth Army were almost enveloped, but were extricated in time by a series of skilful movements, aided considerably by German mistakes; and a general retreat followed. At first this retreat was dictated purely by the pressure of the enemy; but Joffre quickly organised it into a definite manœuvre to gain time for the formation of a new Sixth Army. The Germans failed to realise that the situation had changed and that the retreat had become organised and deliberate. Their advance had been so rapid that their supply organisation was strained to breaking point, and the German high command had lost the complete control that was so essential.

The Battle of the Marne

Then came the Battle of the Marne. The credit of bringing to an end the Allied retreat is variously claimed for Joffre and for General Galliéni. It is possible, and indeed likely, that Galliéni suggested the scheme, but whether this is so or not matters little; the decision rested finally with Joffre as Commander-in-Chief. He decided to stand and give battle on the Marne, and to him falls the honour of having ordered and directed one of the great decisive battles of the world.

In 1916 the enormous losses on the Somme caused uneasiness in Paris. A campaign against Joffre commenced, and was carried on with great determination by the politicians, whom Joffre had annoyed by his independence and his persistent refusal to allow them to enter the fighting area. This campaign was successful, and in December 1916 he was removed from the command in the field.

It cannot be denied that Joffre made many and serious mistakes; but it is beyond dispute that in the darkest days of the War, when the Allies were hovering on the brink of defeat, his unique personality upheld the spirit, not only of the sorely tried Army, but also of the entire French nation.

Exploring the Antarctic

The series of articles on exploration in the Arctic that appeared in the *"M.M."* a short time ago proved very popular, for the heroic exploits and dogged endurance of the men who steadily pushed northwards across the icy regions surrounding the North Pole make a story of absorbing interest. In this connection the recent publication of the diaries of Dr. Andrée and the two companions with whom he set out more than 33 years ago to cross the Pole by balloon is an interesting link with the past.

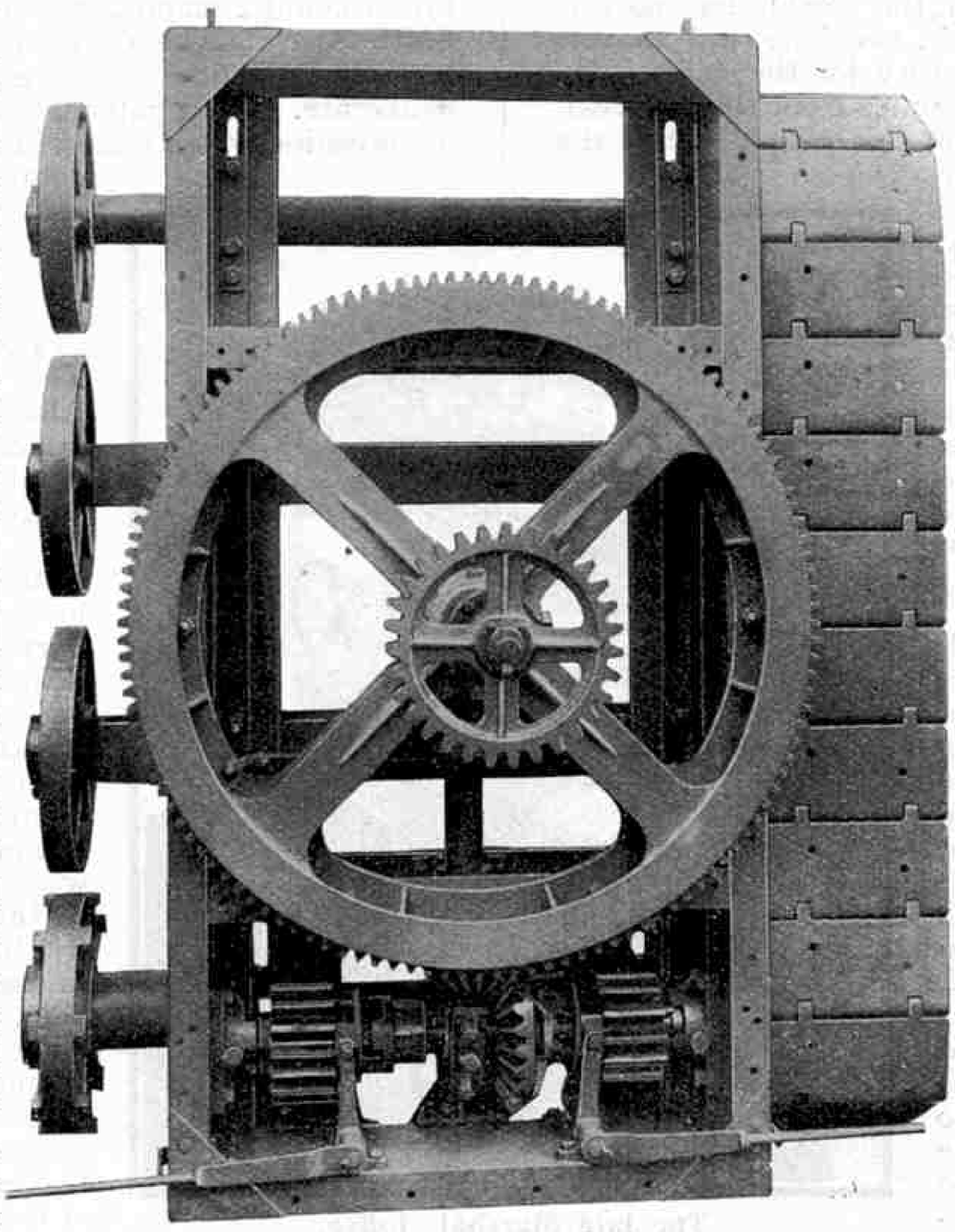
Although serious efforts to penetrate into the Antarctic have only been made in comparatively recent times, the conquest of the South Pole has been as wonderful as that of the Arctic, and I am sure that readers will be interested in a series of articles on exploring the Antarctic that I hope to commence next month.

Modern Mechanical Excavators

A Wonderful Convertible Machine

BEFORE the introduction of excavating machinery, tasks such as cutting canals, digging reservoirs boring tunnels, and sinking the deep foundations of large buildings, were carried out slowly and laboriously by the combined efforts of large numbers of men. During comparatively recent years this manual labour has been replaced gradually by mechanical power, and though some spade work is still necessary, the greater part of the excavation in these great undertakings is now done by huge machines of various types, operated by steam or by electric power. These giant digging machines are each capable of doing the work of hundreds of men and of continuing for unlimited periods.

The most familiar of mechanical excavators are the steam shovel, sometimes called the steam navvy, and the dragline excavator. The steam shovel consists of a huge steel shovel mounted on an arm that is pivoted on a jib. This jib is of heavy design, for it not only takes the stress from the digging rope, but also bears the whole of the excavating stresses from the shovel arm, together with their attendant slewing and digging stresses. It is operated from a steam engine situated in a cab placed in a convenient central position, and the entire mechanism is generally mounted on caterpillar tracks. The steam shovel excavates above the level of the ground on which it stands, and moves forward into the excavation as it proceeds. Such shovels are often to be seen at work in open mines and quarries, or engaged in the excavation of railway cuttings, canals and docks. Under favourable conditions they are capable of performing an enormous amount of work, but they cannot operate on wet or marshy ground, or excavate material below their own level.



The undercarriage of a Priestman "Universal" Excavator mounted on the four steel axles that carry the caterpillar tracks. For this and the other illustrations to this article we are indebted to the courtesy of Priestman Brothers Limited, Hull.

Where conditions are unsuitable for a steam shovel to operate, a dragline excavator is usually employed. This machine also has a massive steel arm and a shovel or bucket, but instead of the bucket being mounted on a pivoted jib, it is slung from the outer end of the arm and is manipulated by a flexible rope. It operates in the opposite manner to a steam shovel, for it excavates below the level on which it stands, and retreats when it has removed all material within reach. The jib is of lighter design and may be of greater length than the jib of a steam shovel, which gives the dragline a wider range of action and enables the bucket to dig a wider cut. The greater length of the jib is made possible by the stresses at its head being less than in the case of the steam shovel.

The dragline has two winding drums as against the single drum of the steam shovel. One drum carries the digging rope, which is connected to a cross-bar above the front of the bucket. The other drum accommodates the hoisting rope that allows the bucket to swing out to the excavation, controls the depth of cut, and raises the loaded bucket. The hoisting rope is attached to the body of the bucket on the side farthest away from the machine.

When the dragline is at work the bucket is lowered to the foot of the excavation, the digging drum is placed in gear, and the rope is then hauled in, drawing the bucket toward the machine and dragging it into the material to be removed. Immediately the bucket has collected a full load the clutch of the digging drum is disengaged and the hoisting drum is thrown into gear. While the hoisting rope is lifting the bucket the digging rope is allowed to run freely, causing the bucket to swing toward the front of the jib. The excavator is then slewed over to the dumping point and the bucket is tilted forward so that its contents are discharged by way of the open mouth.

The dragline and the steam shovel are similar in general construction, and a steam shovel may be designed in such a manner that it can be converted into a dragline if required by fitting a different jib and special bucket and adding another winding drum to the machinery. Even greater adaptability is shown by the "Universal" excavator built by Priestman Brothers Ltd., of Hull. With slight alterations to equipment this machine can be converted into a dragline, a navvy, a trench shovel, a grab, or a skimmer scoop, an attachment for effecting shallow excavation where a level surface is required. The change-over from one attachment to the other can be carried out by unskilled labour in about a couple of hours.

The largest excavator of this type is 15 tons in weight, and its overall dimensions are such that it can be transported easily by rail or motor vehicle, while short journeys can be made under its own power. The machine is provided with caterpillar tracks of ample

bearing surface for travelling over roads without damaging their surface, and for traversing grass land without sinking into it. The undercarriage is built of large steel channel girders, rigidly cleated and gusseted, and is mounted on four steel axles carrying at their ends the driving sprockets for the caterpillar tracks.

Each track consists of a series of cast steel plates connected together by nickel steel pins. These pins have square heads that prevent turning, and are designed so that they can be removed easily for replacement. The track plates are specially designed to prevent the entry of mud and stones, and the inside portions of the plates are shaped to form a smooth path for the rollers, and also to act as driving dogs, engaging with corresponding dogs on the driving sprockets. The sprockets and rollers are of cast steel and are of large dimensions. Efficient adjustment is provided to take up wear in the joints of the track plates, and the arrangement is such that the adjustment screws are in tension.

A 15-ton "Universal" Navvy Shovel at work in Australia.

The caterpillar tracks are steered by means of hand levers on the undercarriage, which actuate clutches on the main clutch shaft. The shafts can be driven separately in a forward or a reverse direction, or locked singly or together. To turn the excavator gradually in any direction the inside track is allowed to run free while the outside track is driven; and to make a sharp turn to right or left the inside track is de-clutched and locked and the outside track is driven.

The motive power of the excavator may be supplied by a four-cylinder engine designed for starting on petrol and running on paraffin; by a high-speed Diesel engine, or by an electric continuous running motor. In each case all the motions are controlled by the same arrangement of clutches. Power for travelling is transmitted from the main engine to the first power shaft and through the centre pin to the tracks by means of spur bevel gearing, no chains being used. A double set of gears is mounted on the top side of the bedplate and operated by a hand lever on the driver's platform. This gearing gives a traction speed of $1\frac{1}{2}$ m.p.h. for road travelling, and $\frac{5}{8}$ m.p.h. for working conditions.

The reduction and transmission gear from the engine to the main clutch shaft is enclosed in a specially-designed gear box that forms an oil bath and ensures silent running. The gear box is designed so that the top half can be easily removed for inspection without disturbing the shaft bearings or removing the oil. The friction clutches transmitting the power of the engine to the slewing, travelling and lifting motions are of ample size to transmit the full power of the engine and to accelerate quickly. When the swing clutches are disengaged the machine is free to centre itself over the load. The normal rate of slewing is six circles per minute, so that with quick acceleration of the clutches the operator can work at a rate of three cycles per minute.

The excavator is equipped with two winding drums mounted on separate shafts, one behind the other. Each drum is deeply grooved to prevent rope slip, and is free running and fitted with its own clutch and brake. The drums are operated by Priestman patent relay clutches, which are so designed that the engine provides the power for their engagement. When the machine is being used as a grab excavator the front winding drum is utilised for the holding or opening rope, and the rear drum is used for closing and hoisting the grab.

Cutting a trench through hard gravel with the aid of a "Universal" Trench Shovel.

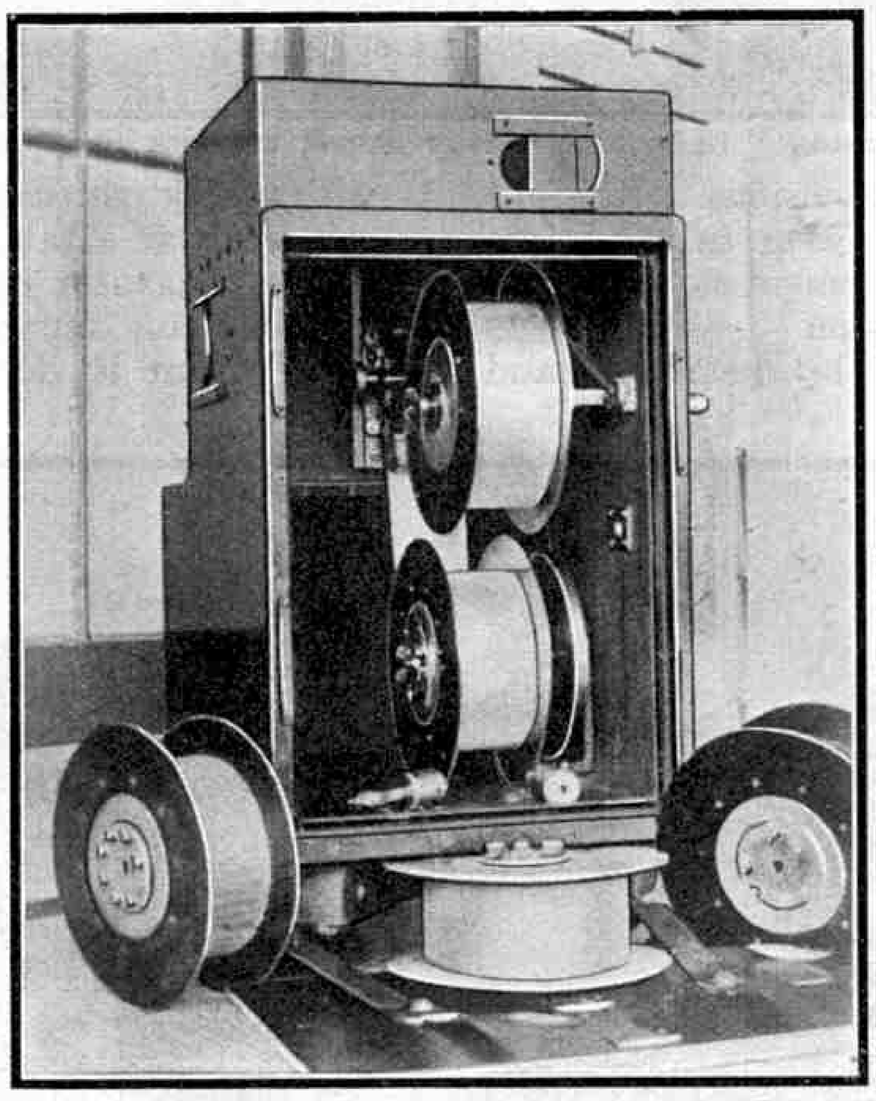
The ordinary operations of the machine, travelling, lifting and slewing, are controlled by four hand levers operating the clutches and two foot pedals governing the brakes. This control mechanism is grouped at one side of the machinery in a position that ensures the driver having a full view of the work in progress. Two of the four levers are fitted with patent load easing gear which, by the movement of one of the pedals, simultaneously releases the main clutches when their respective brakes are applied. This operation eliminates all shock on the (Continued on page 178)

LIVES OF FAMOUS INVENTORS

XVI.—AUGUSTIN LE PRINCE AND THE KINEMATOGRAPH

THE unveiling in December last at Leeds of a memorial to Augustin Le Prince has drawn attention to the achievements of this almost unknown inventor, and has aided in establishing him as one of the real pioneers of kinematography.

Kinematography is the art of making and projecting moving pictures, and the word is derived from the Greek *kinema*, meaning movement, and *graphein*, meaning to write or describe. In common with most other great technical achievements, kinematography is not the work of one man, but is the result of the progressive labours of many independent experimenters and inventors. The earliest attempts to produce moving pictures consisted of photographing series of " still " pictures, each depicting one movement, and mounting these photographs on a disc or wheel that was rotated in a projector. In this manner the photographs were shown rapidly in their correct sequence, and the result was to give some appearance of animation to the picture. The chief drawback to this method was the slight pause after the showing of each picture while the disc or wheel was turned round to the next one. In those days films were unknown, and the necessary photographs were taken on glass plates.



The single-lens Camera invented by Le Prince, showing the drums carrying the sensitised paper ribbon.

The earliest successful attempt to take a moving picture of an object in motion appears to have been made in 1872 by Edward Muybridge, an American photographer. The interest of Le Prince in kinematography was in some measure due to Muybridge's success, and therefore the manner in which this early picture was made is of interest.

Muybridge outlined his scheme for taking moving pictures to a friend, Governor Stanford, who placed at the photographer's disposal his exercising track and his stud of horses. Muybridge built a studio facing the track and mounted in it 24 cameras side by side with their lenses parallel. On the opposite side of the track he built a white fence to act as a screen. From each camera he stretched a thread across the track to the screen, each thread holding in position the shutter of its camera. When all was ready a horse was brought to the starting line, and at a given signal it was sent rapidly down the track. As it passed each camera in turn it snapped the thread controlling the shutter and thus photographed itself 24 times as it sped along. It is important to note that the pictures obtained by this method did not show the horse as it would have appeared to the eye of a single person watching, but as it would have been seen by 24 people standing in a row and looking straight before them.

During the following six years Muybridge carried out many other experiments, and subsequently toured the United States to exhibit his pictures. In 1882 he came to London and gave an exhibition at the Royal Institution. His method of making moving pictures was crude, but the results that he obtained were sufficiently successful to attract to the subject many experimenters, including Le Prince; and from that time kinematography went steadily forward.

Louis Aimé Augustin Le Prince was born at Metz on 28th August, 1842. His father was an officer in the French Army and was a friend of Louis Daguerre, the inventor of the daguerreotype process of photography. This fortunate circumstance enabled Le Prince to learn at first hand the art of photography as it was then practised. Le Prince was educated at Bourges and Paris, and later he studied chemistry and physics at Leipzic University. Subsequently he devoted himself to painting and photographic work, and in the course of his studies he visited Italy and other countries. In 1866 he came to England, and at the invitation of John R. Whitley, a college friend, he settled in Leeds and joined the firm of Whitley Partners, brass founders, of Hunslet. When the Franco-Prussian War broke out he went back to Paris, where he served as an officer of volunteers during the siege. After the war he returned to Leeds and, aided by his wife, founded a School of Applied Arts, in which he specialised in ceramics and colour photographs on enamel. His work soon became

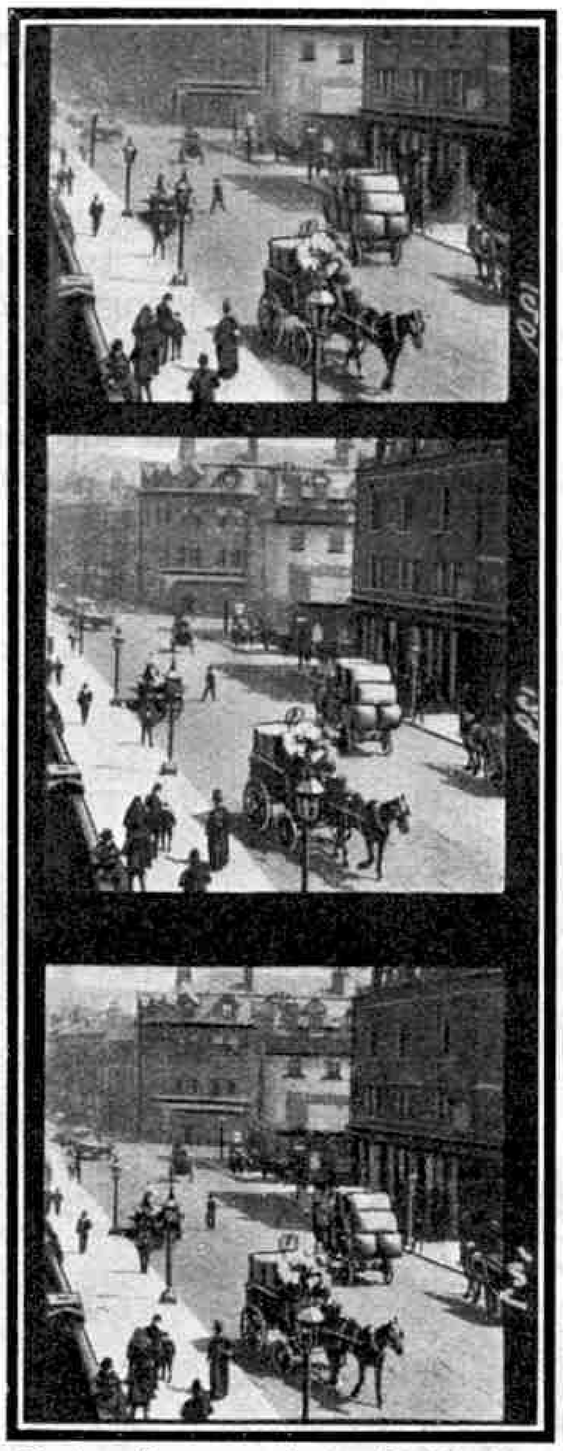
very popular, and he carried out commissions for various members of the Royal Family.

During the early seventies Le Prince learned of the achievements of Muybridge and, foreseeing that the production of moving pictures would lead to enormous commercial possibilities, he began to experiment on his own account. In the meantime Whitley had become interested in a new process of wall decoration, and at his invitation Le Prince accompanied him to America to assist him with the artistic side of the business. While in America Le Prince's interest in motion pictures was revived, and when Whitley returned to this country Le Prince remained in America to manage a company that had been established to produce circular panoramas of naval and military scenes at New York, Washington and other cities. He found time to continue his experiments, and during 1886 he succeeded in making a camera to produce moving pictures, for which he obtained an American patent.

Early in 1887 Le Prince returned to Leeds and established a workshop at 160, Woodhouse Lane, where he occupied himself with improving his invention. He was aided in this work by a number of capable assistants, including John W. Longley, the inventor of the first automatic coin-fed machine to deliver tickets and tokens. By the close of the year Le Prince had devised a single-lens camera for photographing moving objects, and in 1888 he obtained a British patent for "a photographic receiver provided with one or more lenses and one or more shutters, in combination with one or more intermittently operated film drums," and intended for producing "a number of images of the same object or objects in motion." The taking of pictures with this camera was effected by a "continuous alternate operation of the film and its corresponding shutter or series of shutters." The specification refers to the film being "punched with holes fitted on the pins of guiding wheels," and adds that the "sensitive film for the negatives may be an endless sheet of insoluble gelatine coated with bromide emulsion or any convenient ready made quick acting paper."

Probably the most interesting reference in the patent is that in which Le Prince forecasts the use of colour for moving pictures, and it is claimed that he was the first to recognise this possibility. He says in the specification: "Once well developed and toned, the transparencies may pass through the hands of artists who will tint them in transparent colours, dyes or lacquers as the subject may require." He obtained similar patents in Austria, Belgium, Italy and France, and these and also the British patent differed from the one obtained in America only in describing a camera having either a single lens or multiple lenses.

With his single-lens camera Le Prince photographed moving pictures at the rate of 12 per second, and eventually he made a successful series at 20 per second, this being the first series made at this speed with a single-lens camera. The improved camera made necessary a projector capable of being operated at the same speed, and after many experiments Le Prince evolved a projector by means of which he was able to exhibit his pictures on a screen. The machine was electrically operated by current from a Crompton dynamo driven by a Roby steam engine and boiler. It is claimed for Le Prince that he was the first to show moving pictures on a screen by means of a projector illuminated by an arc lamp. The plant was erected in the yard of No. 150, Woodhouse Lane, Leeds, and the current was conveyed by cables over the intervening buildings to the workshop at No. 160.



Part of a series of Moving Pictures photographed with the single lens camera.

The development of kinematography received a great impetus from the introduction of celluloid film. The first patent for the use of celluloid in narrow ribbons as a means of showing moving pictures was obtained in 1887 by the Rev. Hannibal Goodwin of Newark, U.S.A. When celluloid film became commercially available Le Prince was quick to utilise it. Frederick Mason, one of his assistants, has stated that the inventor "obtained some rolls of sensitised film called celluloid. As these were too wide I cut them in halves on a lathe, working with a red lamp at night, thus making two narrower films from the larger one. The films I cut would be about $2\frac{3}{4}$ in. wide, and when developed were transparent."

In August 1890 Le Prince went to France to attend to patents and other business. He accompanied friends as far as Bourges, and on 16th September he boarded a train for Paris on the way to visit his brother, an architect at Dijon. From that moment Le Prince vanished, and was never seen or heard of again. Exhaustive enquiries were made by the French and the English police, and by members and friends of the family, but no clue to the mystery was ever discovered. A sinister aspect of the affair was the fact that Le Prince's luggage and business papers had disappeared with him. His widow was convinced that he was the victim of foul play, and that he had been removed by the agency of persons who desired to obtain control of the moving picture situation. If this was the case his enemies achieved their object, for nothing could be done in regard to the master patents held by him until the statutory period of seven years had elapsed. His death was then legally presumed, and his affairs were administered; but by that time many other inventors had taken up kinematography, and the position was entirely changed.

Louis Aimé Augustin Le Prince.

An interesting description of Le Prince is given in a tribute to him by his assistant Mason, who speaks of him as being "in many ways a very extraordinary man, apart from his inventive genius, which was undoubtedly great. He stood 6 ft. 3 in. or 4 in. in his stockings, well built in proportion, slow moving, most gentle and considerate, and though an inventor, of an extremely placid disposition, which nothing could ruffle . . . . also extremely just."

(*Continued on page 117*)

Blasting the Foot of a Mountain

Track Widening on the New York Central Lines

LAST year was brought to completion the twenty months' task of building a third and a fourth track on the Hudson Division of the New York Central Lines between Garrison and Beacon, New York. This section of the railway previously was something in the nature of a bottle-neck, and traffic during the morning and night rush hours was seriously handicapped. The opening of the two new tracks means that the four-track territory of the New York Central now extends approximately 104 miles outward from Grand Central Terminal, except for three small gaps; and it has resulted in greatly improved running of trains between New York and Albany.

In the course of the work 840,000 cu. yds. of rock were blasted away—enough to fill 34,000 freight cars with an average load of 50 tons each! If coupled together these cars would form a continuous line of more than 250 miles! Of this great mass of rock, 800,000 cu. yds. were cut from the cliffs that rise often more than 100 ft. above the road bed and the river below. The task meant literally cutting off the toes of the mountains that rise abruptly at that point from the Hudson. When the original two-track route was laid out there, following the bank of the river and cutting across small bays, the road bed in many places was pushed by the rocky bluffs close to the water's edge, and at some points was built across rock fills extending into the river. In the new four-track route between Garrison and Beacon, the road bed is almost entirely on the solid rock that characterises the geology of that region. Much of the rock removed has been used in improvement and construction work on other sections of the New York Central Lines.

The blasting out of such a mass of rock would have been a tremendous enterprise in any circumstances, but in the conditions that existed here it was a work of extraordinary difficulty. It had to be accomplished while passenger and freight trains were fulfilling their daily schedules, with trains passing at an average rate during busy periods of almost one each minute-and-a-half. Only two blasts of dynamite were allowed each day. During all phases of the excavation two New York Central officials were stationed in telephone booths beside the job, where they had a clear and uninterrupted view of the great slice of rock, which was 4,000 ft. in length, and as much as 90 ft. in height. They were at times all in telephonic communication with a train dispatcher, so that they could notify him when the contractor was ready to fire a blast of dynamite. Flagmen were then sent out in each direction, and when the dispatcher gave permission, and not until then, was the blast fired.

Work proceeding on the cliff tops high above the Hudson River during the widening of the New York Central Lines track.

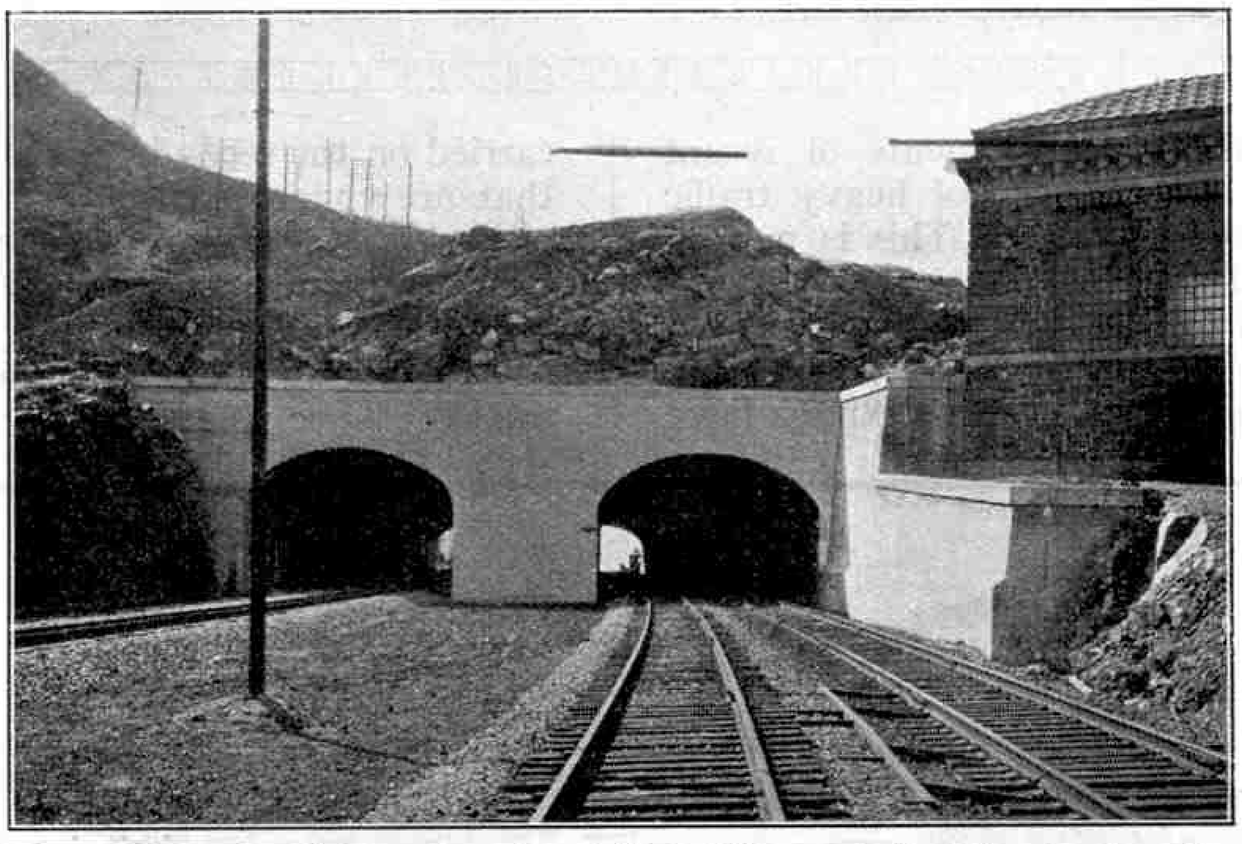
In order to avoid all possibility of any isolated fragments of shattered rock falling on the existing tracks, these were covered during blasting with two layers of cross ties, placed at right-angles. If any rock did come down, a large proportion of the working force of 1,000 men were ready to clear it away instantly. The ties were then removed and a thorough inspection was made before traffic was resumed.

Almost at every turn operations were severely handicapped by the existing conditions. Three tunnels had to be bored through rock, necessitating the cutting away of approximately 40,000 cu. yds. of stone; and this work was carried on so close to the main line that every movement had to be under the most careful supervision. One of the three tunnels was a new 540-ft. double-track tunnel through solid rock.

A mountain side was cut into for a distance of about 5,000 ft. at the south end of the project to provide for the two additional tracks, and to straighten the old alignment. The height of the excavation or rock ledge at this point extended to an average of about 60 ft. and necessitated the removal of some 500,000 cu. yds. of rock and earth. North of Garrison, an old tunnel that had been abandoned in 1922 when a deep rock cut about 800 ft. in length was excavated, was rebuilt, as were its approaches, providing two east-bound main

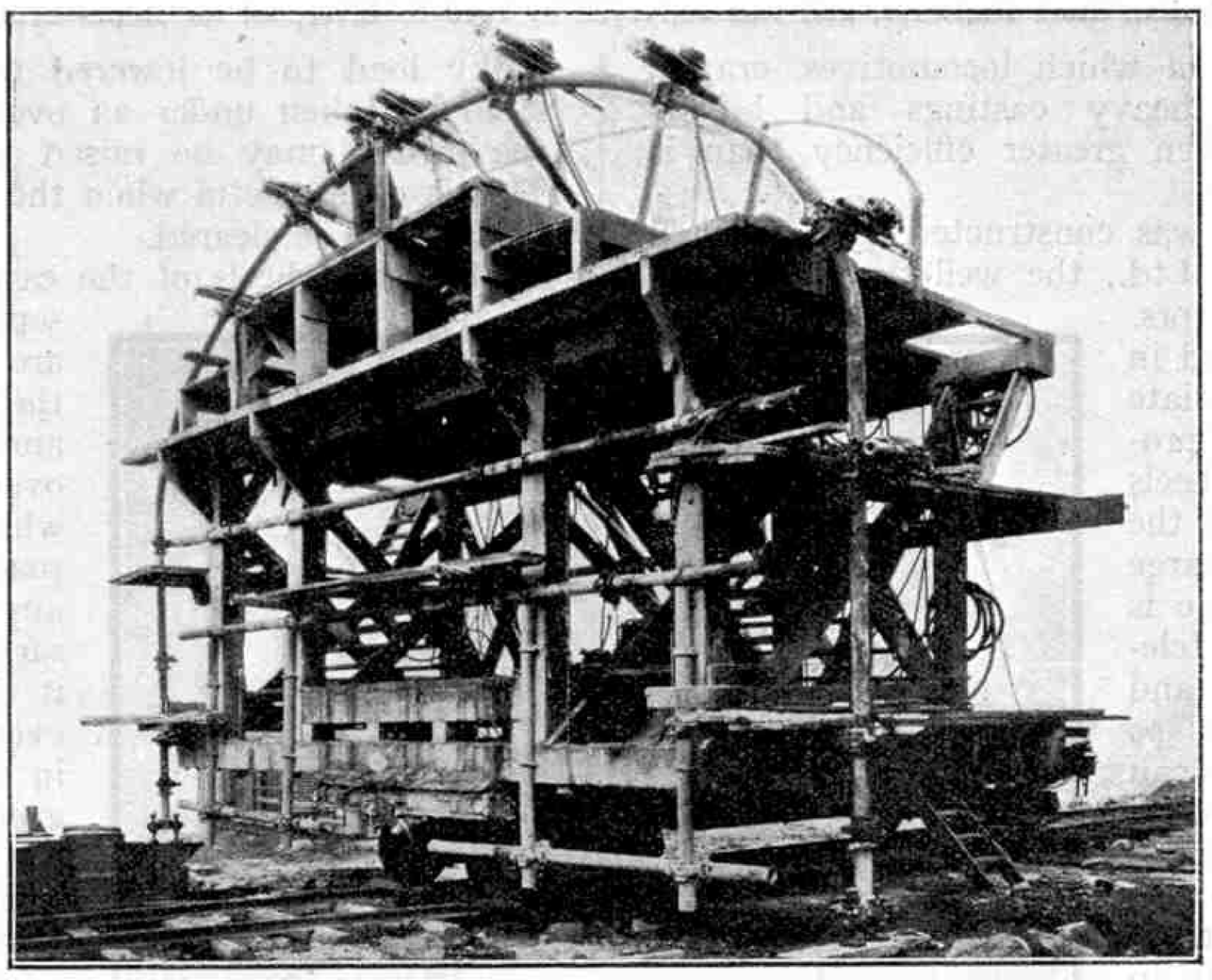
tracks in the cut east of the tunnel, which is being used for westbound traffic. The old tunnel was increased in height to 27 ft. and enlarged to a width of 38 ft. and lined with concrete. When finished it had a clear height of 22 ft. and a base width of 33 ft. This and other work in the vicinity included the removal of about 30,000 cu yds. of rock from a projecting bluff at the north end of the tunnel.

The new cut is wide enough for two tracks, parallel to, and about 40 ft. from, the old tunnel. Trains were diverted through the cut while the old tunnel was reamed out to its maximum width and height. Then trains were again turned into the tunnel while the cut was given over to the contractors to have the rough corners whittled off so as to afford a better alignment. When this was done the cut was again used for the two westbound tracks, while the tunnel accommodated the two eastbound tracks.



The new Breakneck Tunnel on the right is drilled out of solid rock alongside the old tunnel on the left.

At a point known as the Ware cut, rock was cut back to a maximum distance of about 70 ft. and extended up an almost vertical face to heights ranging from 85 ft. to 110 ft. From here 175,000 cu. yds. of solid rock were blasted away. Two long sidings were rebuilt beyond the Ware cut into standard main tracks, and the widening was continued in more or less light cuts and fills until near Cold Spring, where the heavy rock excavation of considerable height was again met. This work involved the removal of approximately 30,000 cu. yds. of material, and continued in a succession of cuts for about half a mile north of Cold Spring, and then ran into territory where the land adjoining the railway was comparatively flat.



The tunnel work was completed with only light blasting by means of a framework the size of the tunnel bore, upon which were mounted drills fixed on swivels.

Another big operation was the driving of a new double-track tunnel, 450 ft. in length, through Breakneck Mountain to carry two eastbound tracks. Also the old 540-ft. double-track tunnel through the mountain was enlarged and lined to carry two westbound tracks. Special precautions had to be employed throughout this work. The new tunnel had to be driven alongside the old one without disturbing traffic there, and in addition had to be driven right beside the shaft house of the Catskill water tunnel that crosses under the New York Central tracks at right-angles. Any damage done to either the shaft house or the water tunnel would have been an exceedingly serious matter.

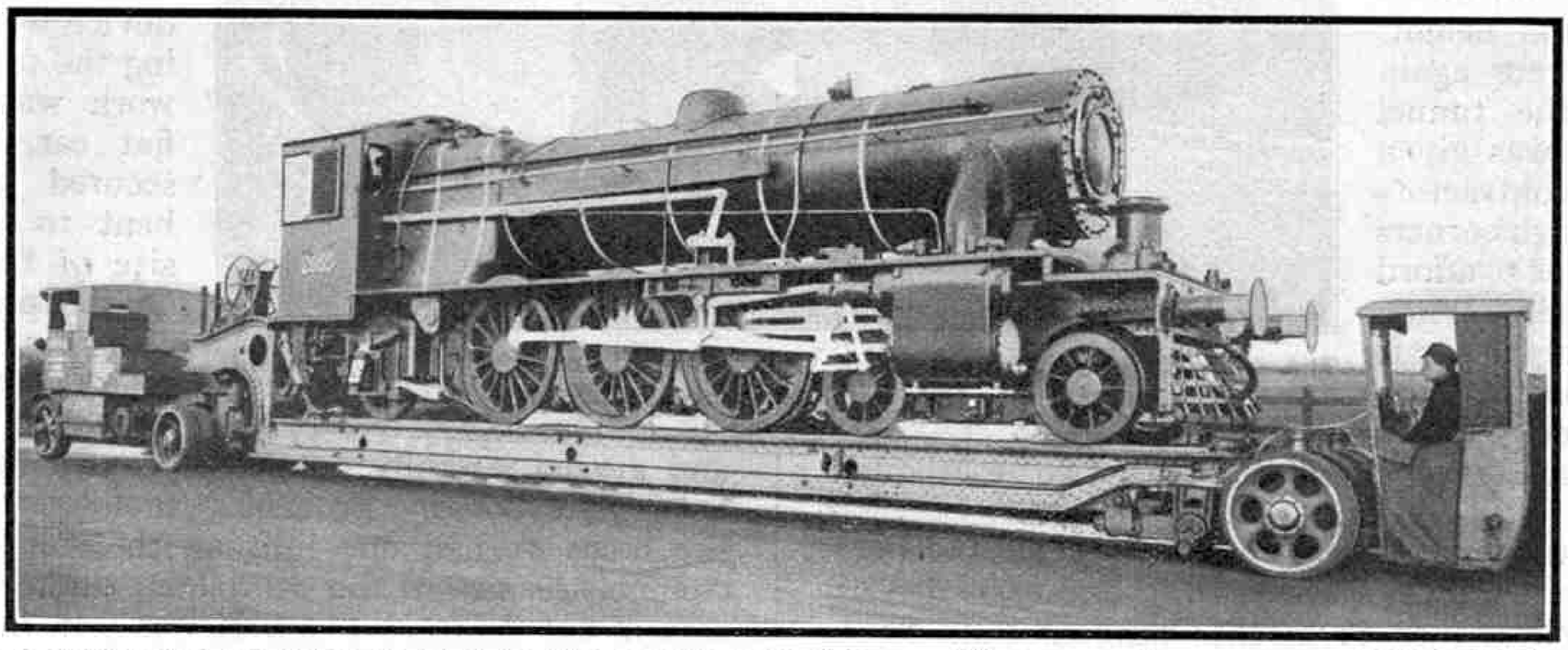
The work on the Garrison tunnel consisted of enlarging the old bore. Practically all the cutting here was done on the eastern side to throw the centre line of the tunnel further to the east, thus reducing the curvature and also the quantity of excavation in the tunnel approaches. Approximately 10,000 cu. yds. of rock were removed in this tunnel by drilling and light blasting. A new device was used for boring the tunnel. A framework was erected on a flat car, to which was secured a $4\frac{1}{2}$ in. pipe bent to the shape and size of the tunnel bore. On this pipe were mounted 14 air drills on swivels so that they could be aimed in any direction and moved laterally on the pipe. In this manner 330 holes were bored. Broaching tools were attached and the holes opened one into another, cutting a kerf or channel the size of the completed tunnel around a rock core in the centre. The kerf was 6 ft. in depth. Then other holes were bored into this core, in which light charges of dynamite were placed and fired by delayed exploders. The air cushion formed by the kerf around the seat of the excavation, combined with the delayed blasts, permitted a minimum of concussion from the blasting. This operation was repeated for the full length of the tunnel, involving 80 set-ups of the drill carriage and the drilling of 26,000 holes.

All three tunnels on the new four-track are lined with concrete and have a width of 33 ft. and a height of 22 ft. above the top of the rail. The whole of the concrete in the tunnel lining was placed by means of a pneumatic concrete drum, which operated at a pressure of 100 lb. and delivered 14 cu. ft. of concrete in a batch. The gun was charged from a cart with a track mounting, which conveyed the liquid concrete from the mixing plant that is set up near each tunnel. For permission to reprint this article we are indebted to the courtesy of the Editor of "*The New York Central Lines Magazine.*"

The World's Largest Lorry

Road Vehicle Carries Locomotive 100 Tons in Weight

ONE of the most striking developments of recent years has been the transference of heavy traffic from the railways to the roads. This is part of the general tendency to return to the roads that has followed the introduction of the internal combustion engine and the motor car. During the past few years larger and more powerful vehicles of all kinds have been introduced, but it is a little startling to find that to-day loads up to 100 tons may readily and easily be transported by this means. This is the limit of the weight that may be carried by the world's largest lorry, by means of which locomotives, cranes, excavating machinery, heavy castings and boilers may be moved with even greater efficiency than is possible on railways.



A locomotive weighing 82 tons on the world's largest lorry. The locomotive was one of 22 built for the Indian State Railways, and was conveyed by road to Liverpool for shipment abroad.

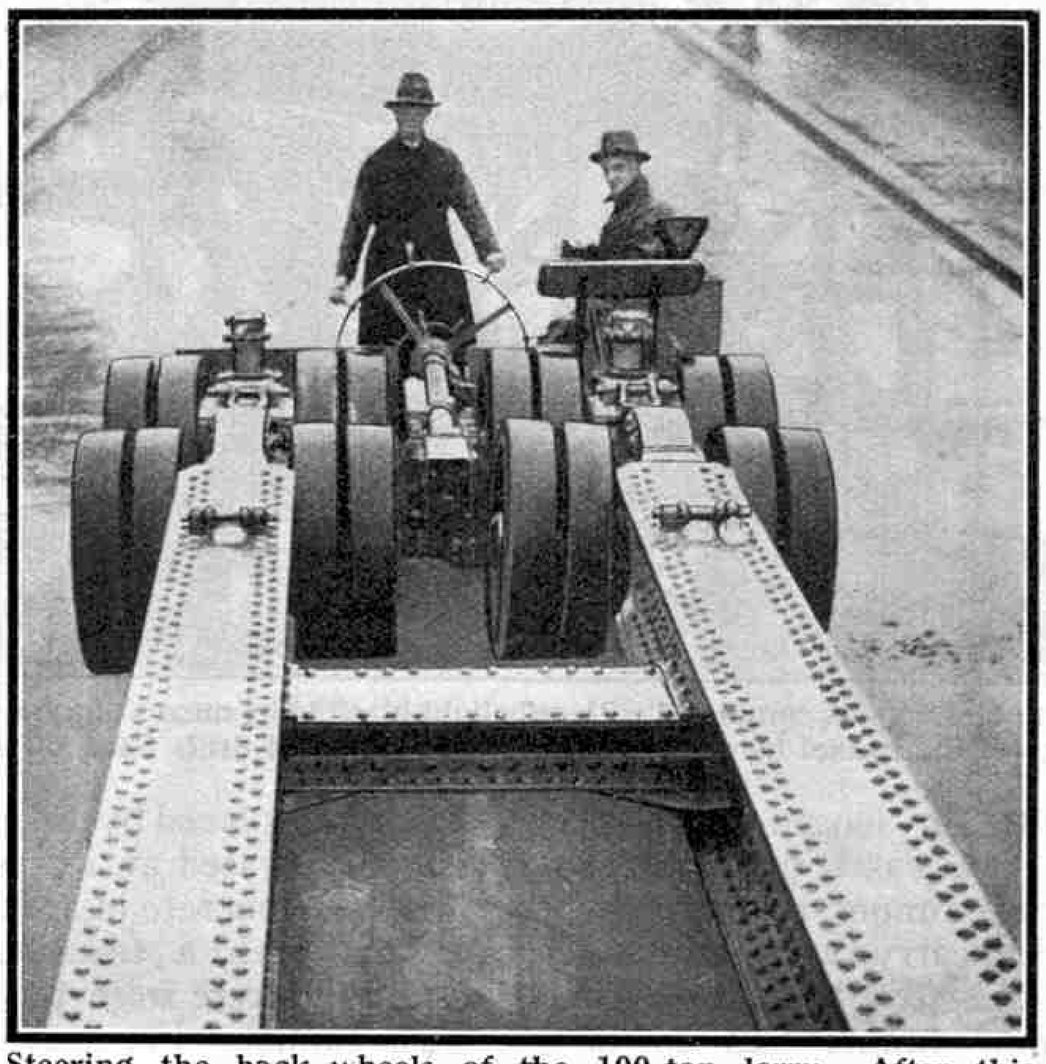
The lorry referred to was constructed by Scammell Lorries Ltd. for M.R.S. Ltd., the well-known firm of road transport contractors. It is 70 ft. in length, and in order to enable it to negotiate corners, steering gear is provided for the back wheels as well as for those at the front. The man in charge at the rear of the vehicle is in communication by telephone with the driver, and the arrangement works so efficiently that the lorry can make an ordinary right angle turn from a roadway measuring 15 ft. in width into one that has a width of 24 ft.

The lorry is really built up in two parts. First comes what may be described as a lorry of the ordinary type. This has a two-wheeled front axle, steered by Ackermann gear, and two rear axles in line, each of which has two wheels mounted on it. The drive is by chain and sprocket wheel. The load itself is carried on the second part which consists of huge girders that are connected to the rear of the front section by means of a swan-necked structure. This rests on a turntable above the rear wheels and may readily be seen in the upper illustration on the next page.

It is this gigantic articulated joint that enables the whole vehicle to turn in such a short space. The swan-neck is connected with the girders of the carrier by means of two hydraulic rams that are operated by a pump behind the cab. When the rams are extended the girders are lowered to the ground, thus enabling a bulky load to be lowered when necessary to enable it to be taken under an overhead bridge. Similarly the girders may be raised by contracting the arms. This is often useful when the crown of a hump-backed bridge is to be cleared.

The rear wheels of the carrier also are mounted on separate axles in line. There are eight of them and thus the total weight of the vehicle and its load is distributed over no fewer than fourteen wheels. In order that the road surface may not suffer any ill effects from the passage of such a gigantic lorry, it is very important that every wheel should remain in steady contact with the ground in addition to bearing its proper share of the total weight. It is for this reason that rear axles of the oscillating type are employed. They do not pass across the full width of the vehicle, and thus its movements are not greatly affected by inequalities of the ground.

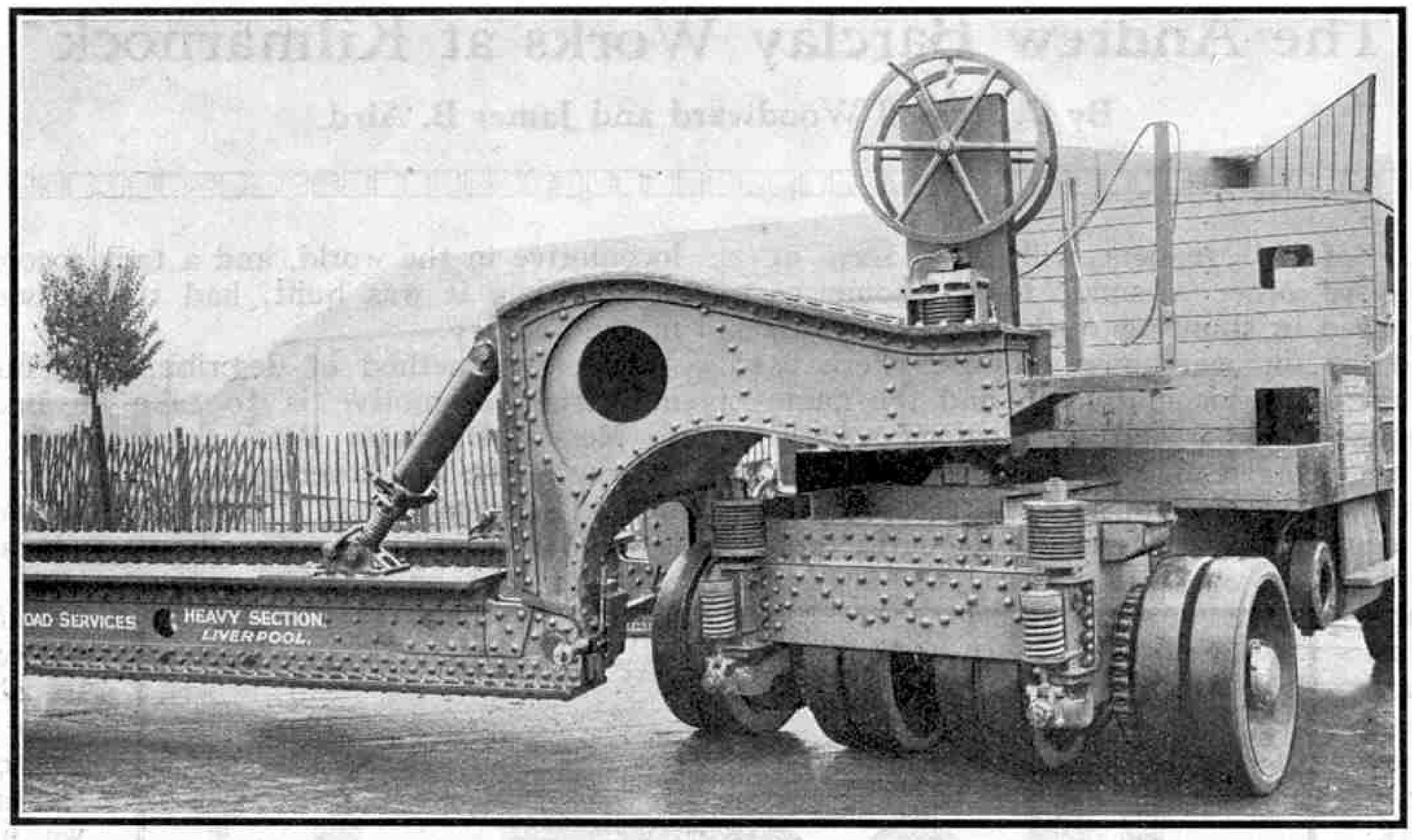
The manner in which the weight is spread out over a large number of wheels is largely responsible for the success of the world's largest



Steering the back wheels of the 100-ton lorry. After this photograph was taken, the cab shown in the upper illustration on this page was provided for the steersman in the rear.

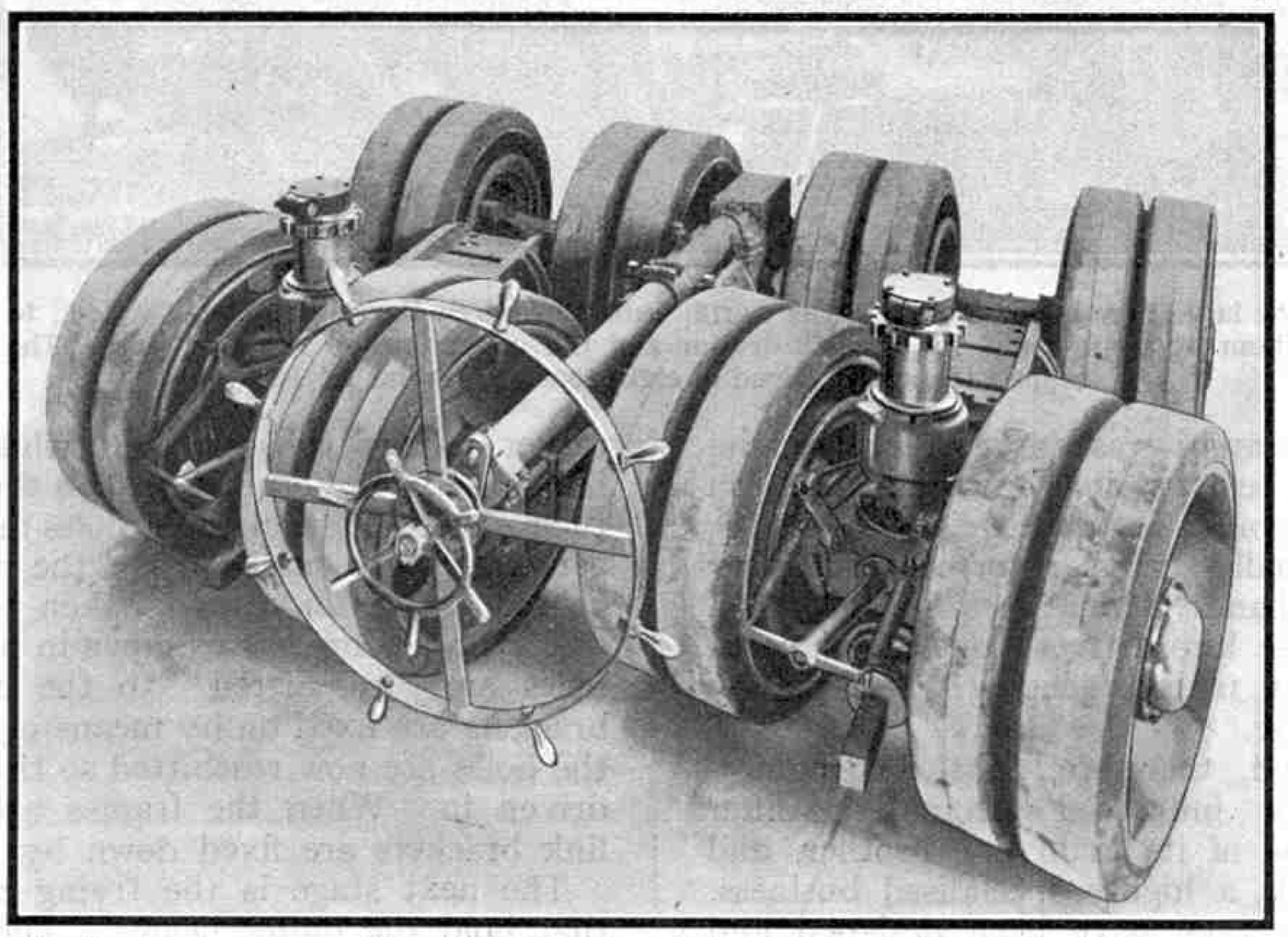
lorry. At first glance it would be thought that a leviathan of this kind, when carrying a giant locomotive or a similar load would pound to pieces the surface of any road over which it travelled. But the lorry moves slowly, its speed with maximum load being from five to six miles per hour, and actually it is said that its destructive effect is less than that of a large saloon car. Naturally, springing is of great importance and rubber is largely used to give the necessary resilience, the springs under the swan-neck, for instance, consisting of rubber rings under compression.

The lorry has eight forward speeds and one reverse, and is driven by means of a four-cylinder petrol engine. At the back of the cab a sleeping cabinet has been erected. In this there is a cooking stove and other equipment necessary to enable the lorry to carry relief men and thus to travel throughout the full 24 hours of every day.



The swan-neck structure that connects the two parts of the 100-ton lorry. This is pivoted on a turntable above the rear wheels of the front portion.

The task of transporting huge and unusual pieces of machinery is by no means an easy one. In many instances it is necessary to plan a route very carefully in order to avoid narrow places in which there is no room to pass, or bridges that are unable to bear the weight of the vehicle and its contents. Even this precaution is not always effective, and when particularly large loads have been carried it has occasionally been necessary to take the drastic course of excavating the roadway under bridges in order to lower it sufficiently to give head room to a particularly tall load. Of course, in such cases the road has afterwards been restored to its original state.



The back wheel assembly of the M.R.S. 100-ton lorry. Four wheels may easily be removed when loads of less than 65 tons are to be carried.

With certain loads of large dimensions it is not necessary to dig up the roadway. For instance, when huge boilers are being carried they may sometimes be removed from the lorry and rolled under bridges that otherwise would be impassable.

When making way for passing traffic the lorry has sometimes been pulled too far to the left. In certain instances the wheels then have sunk in soft ground, and the lorry has come to a standstill. The rams connecting the swan neck with the girders of the carrier have then been of great value. These are extended until the girders rest on the ground, and by means of ratchets on the rams fluid is then driven back into them, with the result that the whole of the motive unit, including the driving wheels, is elevated clear of the ground. Sleepers and plates may then be placed on the ground beneath the wheels in order that they may take a grip and allow the lorry to move onward once more.

One of the most interesting uses to which the huge lorry is put is the transport of locomotives intended for export. From the works in which they are built these must be taken to the docks. As a rule, they are unable to run on existing railway lines because of the difference in gauge, and to load them directly on trolleys for transport by rail also is often impossible because of the loading gauge restrictions. For carriage by rail, therefore, it is usually necessary to remove various parts in order to reduce the size of the load, and in most cases locomotives are almost entirely dismantled for transport, and re-erected on arrival at their destinations.

The introduction of the M.R.S. lorry makes these steps unnecessary, for by its use *(Continued on page 161)*

HOW THINGS ARE MADE

Industrial Locomotives

The Andrew Barclay Works at Kilmarnock

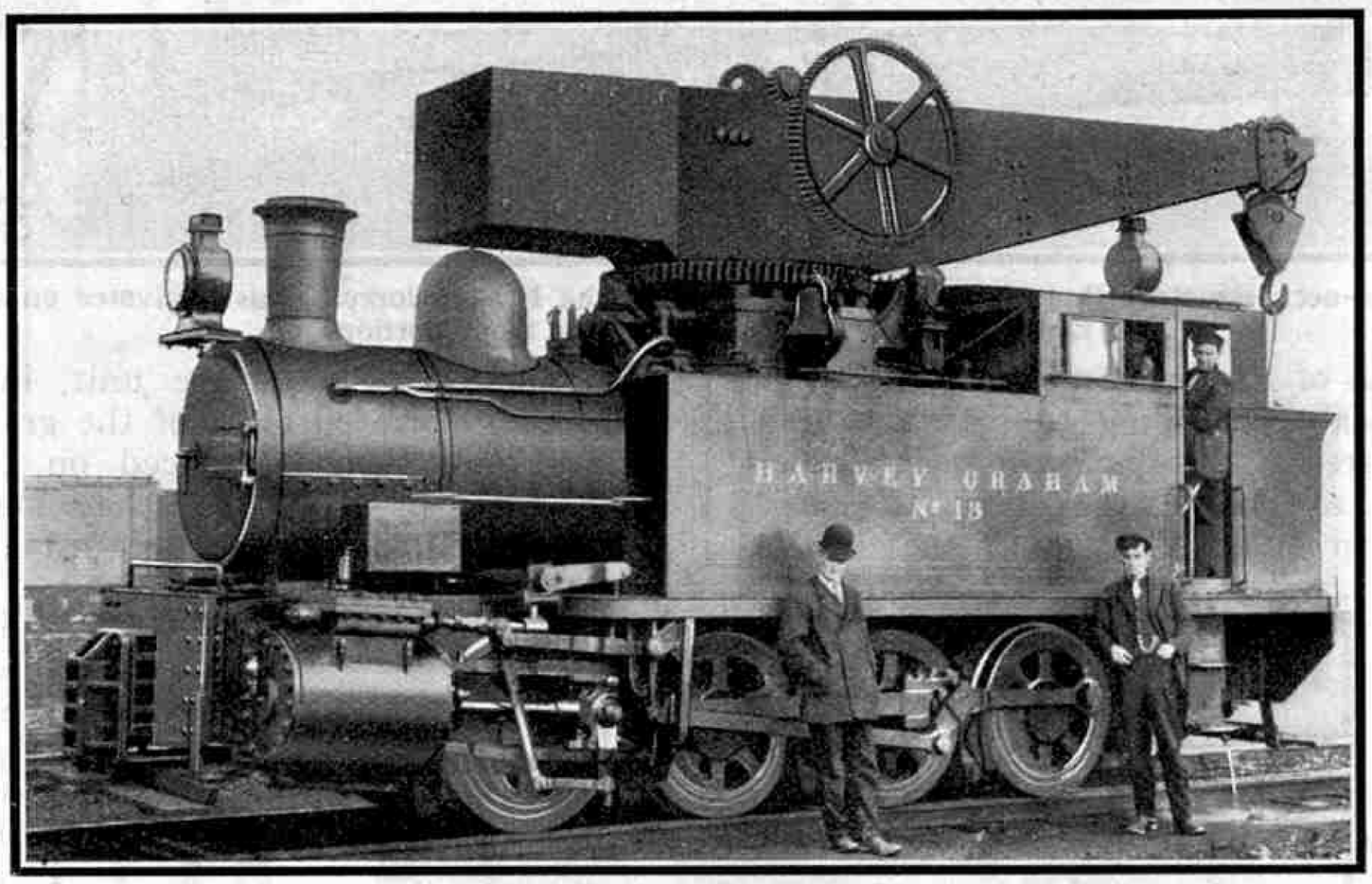
By C. Russell Woodward and James B. Aird

ALMOST all "*M.M.*" readers will have seen at some time or other a small tank locomotive busily engaged in shunting work at a dockyard, or timber yard, or in warehouse sidings. Perhaps they have examined the locomotive to find the name of a railway company and have found instead a brass plate bearing a name, usually quite inappropriate, such as "Venus" or "Mammoth." Large numbers of these little locomotives are owned by contractors, dock boards, millers, and in fact, almost all firms that own private sidings for their own wagons. They are used mainly for shunting work, although in the case of docks they may be seen also on "through" goods trains running along the line of docks.

In spite of their apparently insignificant size these industrial locomotives are wonderfully strong and efficient. They have to stand up to far rougher usage than main line railway locomotives, for they are rarely washed out, and repairs are postponed to the last possible moment—until in fact the engine cannot move its own weight. All day long they are continually being reversed, and very often the drivers who handle them are quite unskilled. On top of all this these locomotives are heavily overloaded, not occasionally in emergencies, but regularly and as a matter of course.

It will be understood, therefore, that the requirements for an efficient industrial locomotive differ considerably from those of its main line brother, and the building of them is a highly specialised business. Large numbers of this type have been designed and built by Andrew Barclay, Sons & Co. Ltd. of Kilmarnock, to whom we are indebted for much of our information. The quality of the locomotives produced by this firm may be estimated from the fact that a four-wheeled saddle tank supplied by them to the River Weir Commissioners has been at work daily for more than 70 years. Among their other products is the largest crane locomotive in the world, and a tank locomotive which, at the time it was built, had the heaviest axle load in the country.

The best method of describing the building of an industrial locomotive is to take an imaginary visit to Messrs. Barclay's Works and follow the different stages in the construction of one. For this purpose we will select a 16-inch four-wheeled saddle tank, which is one of the firm's specialities, and is among the most useful types of industrial locomotive owing to its ability to traverse sharp curves.



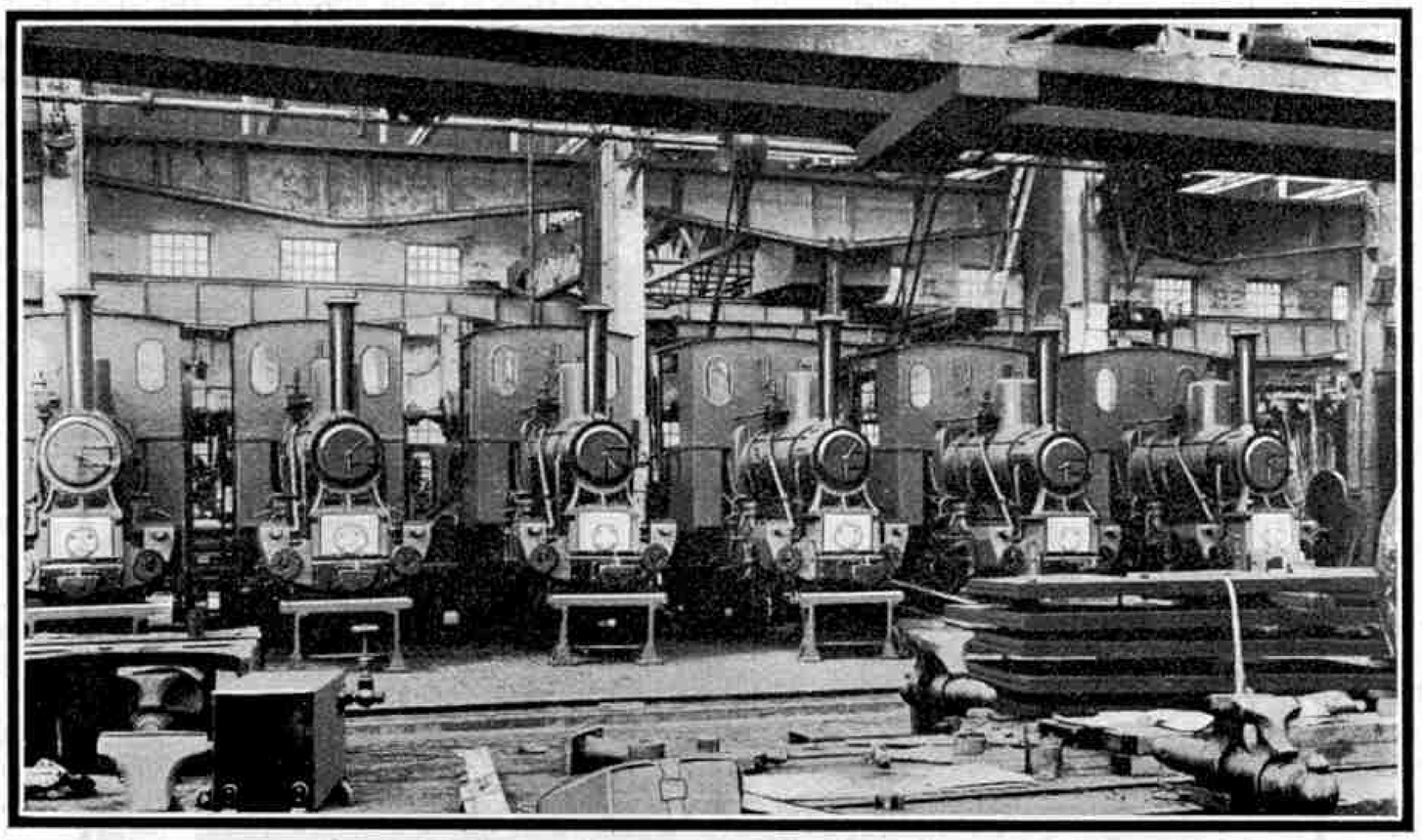
The largest crane locomotive in the world, built by Andrew Barclay, Sons & Co. Ltd., to whom we are indebted for this illustration and the upper one on the next page. The crane can handle a load of eight tons at a radius of 16 ft.

Proceeding to the erecting shops we find that the place where the locomotive is to be erected has been chosen, and the frames, which have already been marked out, drilled and slotted, are laid out on trestles. First the axle-box guides, or "cheek blocks," are bedded down and the holes marked off, after which the guides are sent away to be bored. Then follows a period of rather tedious measurement while the various centre lines are marked off. After this the cylinders are tried in their places. The cylinder holes in the frames have been drilled slightly smaller than the required size, and the frames and cylinders are taken to the vertical driller. The cylinders are bolted down in position, and the frame holes are "rosebitted" to the correct size. Various brackets are fixed on by means of temporary bolts, and the holes are now rosebitted so that fitted bolts may be driven in. When the frames are finished the spring link brackets are fixed down by means of cold rivets.

The next stage is the trying on of the angle irons that hold the buffer beams. There are eight of these irons and they are bolted to the frames. If they fit correctly they will be taken on a bogie to the boiler shop where they will be riveted. While this is being done, other parts of the engine are being collected together and placed ready to hand. The angle irons must be marked off for drilling, and after this the stay plates must be marked off, fitted together, and bolted with

service bolts. They are then sent to the boiler shop for riveting. When the wheels complete with axles and other parts are ready, the axle-boxes, eccentric straps and the bushes may be bedded down. An eccentric strap, by the way, is a ring made of wrought iron, mild steel, or cast iron, by which the motion of the eccentric is transmitted to the valve gear. After the bushes are fitted the eccentrics may be fixed.

The frames now return from the boiler shop and are set up on trestles placed the correct distance apart, and squared up. The smoke-box saddle is lowered into position, followed by the foot-plate stay; and these are fitted with temporary bolts. The saddle holes are then rose-bitted by a compressed air drill so that a few bolts may be fitted. The frames are now tried with a straightedge and any twists or distortions are "pinned" or knocked out with a hammer until they are sufficiently straight. In the meantime the buffer beams have been drilled and are now secured to the angle irons by $1\frac{1}{8}$ in. bolts. The various angles and gusset stays are fitted and bolted into position, and then comes a gang of riveters from the boiler shop to rivet them on.



A group of 0-4-0 well tank locomotives for 2 ft. gauge lines.

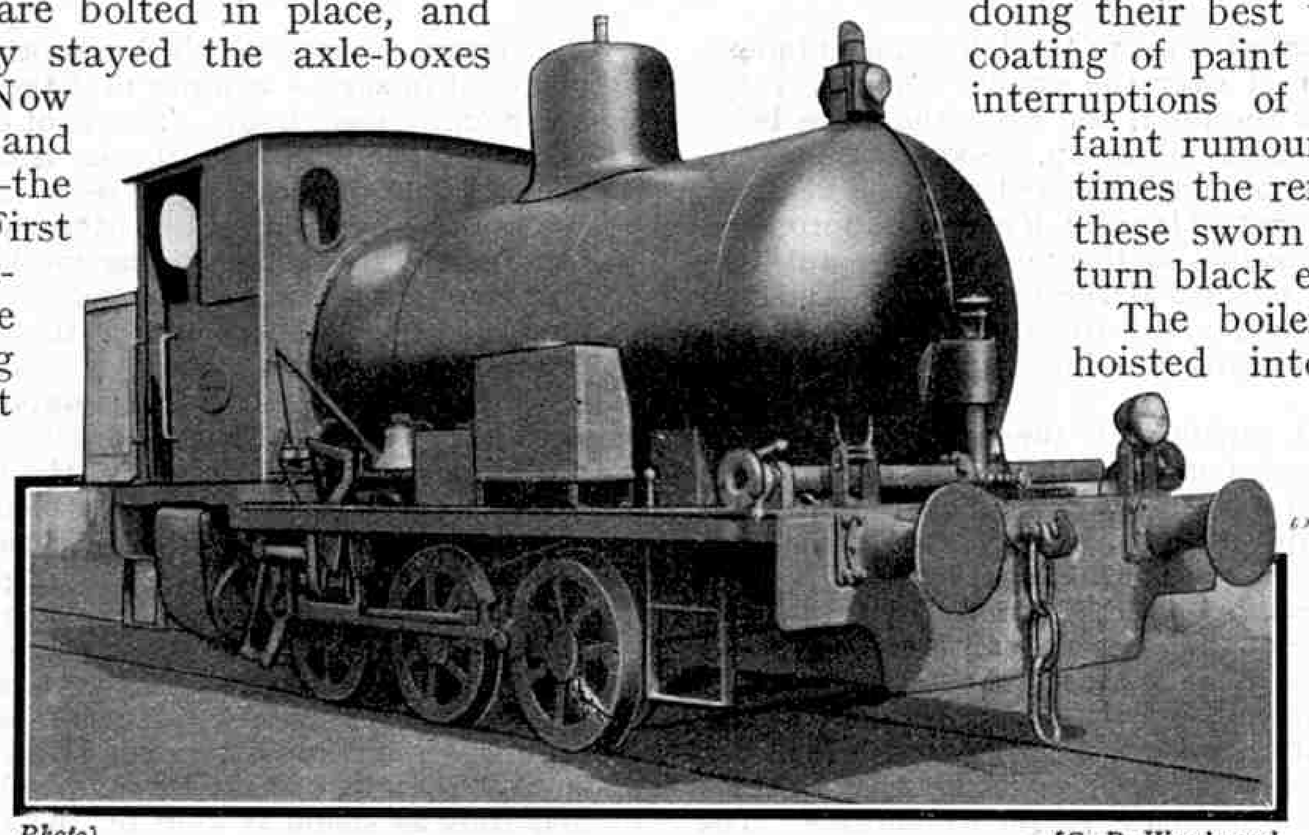
The axle-box guides are bolted in place, and when they are correctly stayed the axle-boxes themselves are fitted. Now comes one of the hardest and most delicate jobs of all—the fitting of the cylinders. First of all a wooden straightedge is laid along the centre line of the driving axle. A line is now set from the straightedge to the centre of the cylinder so that it runs exactly parallel to the frames. The ends of the cylinder are then measured with calipers, and if the line runs dead through the centre of the cylinder the permanent bolts may be driven in and the nuts tightened up. Possibly, however, the cylinder will have to be taken down to have a little filed off the back to bring it into the true line, but if the frames have been straightened up with reasonable care, this should not be necessary. When the cylinders have been set up the slide bars are put into position, and after they are in place they are examined and passed by the foreman.

The next item is the fitting of platform plates. These already have been marked off, drilled and riveted to the long angle irons that run from front to rear buffer beams. They are now hoisted into place and bolted to the supporting irons and stays. The fitting of the motion may now be proceeded with, but first of all the engine must be lifted on to its wheels. Two cranes are brought and the engine is hoisted up. The wheels are then rolled underneath and the engine is lowered half an inch at a time until the axle boxes are fitted into their places between the guides. Then, after the tie bars have been bolted, the engine is raised again on to the trestles.

In the meantime the cab has been brought over from the boiler shop in sections. Apprentices have erected it and bolted it firmly together, and after having dressed all rough corners taken it to the paint shop. The boiler will now be brought over by a little 0–4–0 side tank that rejoices in the name — strictly unofficial—of "*Felix.*" The apprentices will now take up their position on the engine and bed down the boiler into position on the smoke-box saddle. When this has been done the holes are marked on the smoke-box, the boiler is lifted out, and the holes are drilled by compressed air.

All the time that erection is going on the painters are doing their best to give the frames their coating of paint in spite of the frequent interruptions of the fitters. There are faint rumours floating about that at times the remarks that pass between these sworn enemies are such as to turn black enamel to bright scarlet!

The boiler is now ready and is hoisted into position and firmly bolted down. Next the exhaust and steam pipes are tried in, great care being taken that the steam pipes from each cylinder meet correctly on a T piece in the smoke-box. When the faces of the pipes fit against each other they are marked and sent away for drilling. On their return the asbestos joints will be cut and the pipes fitted together and screwed up tightly. Precautions have to be taken to prevent nuts or bolts—or as the foreman suggests, apprentices!—falling down the blast-pipe, and to guard against such accidents a piece of sacking is laid over the orifice.



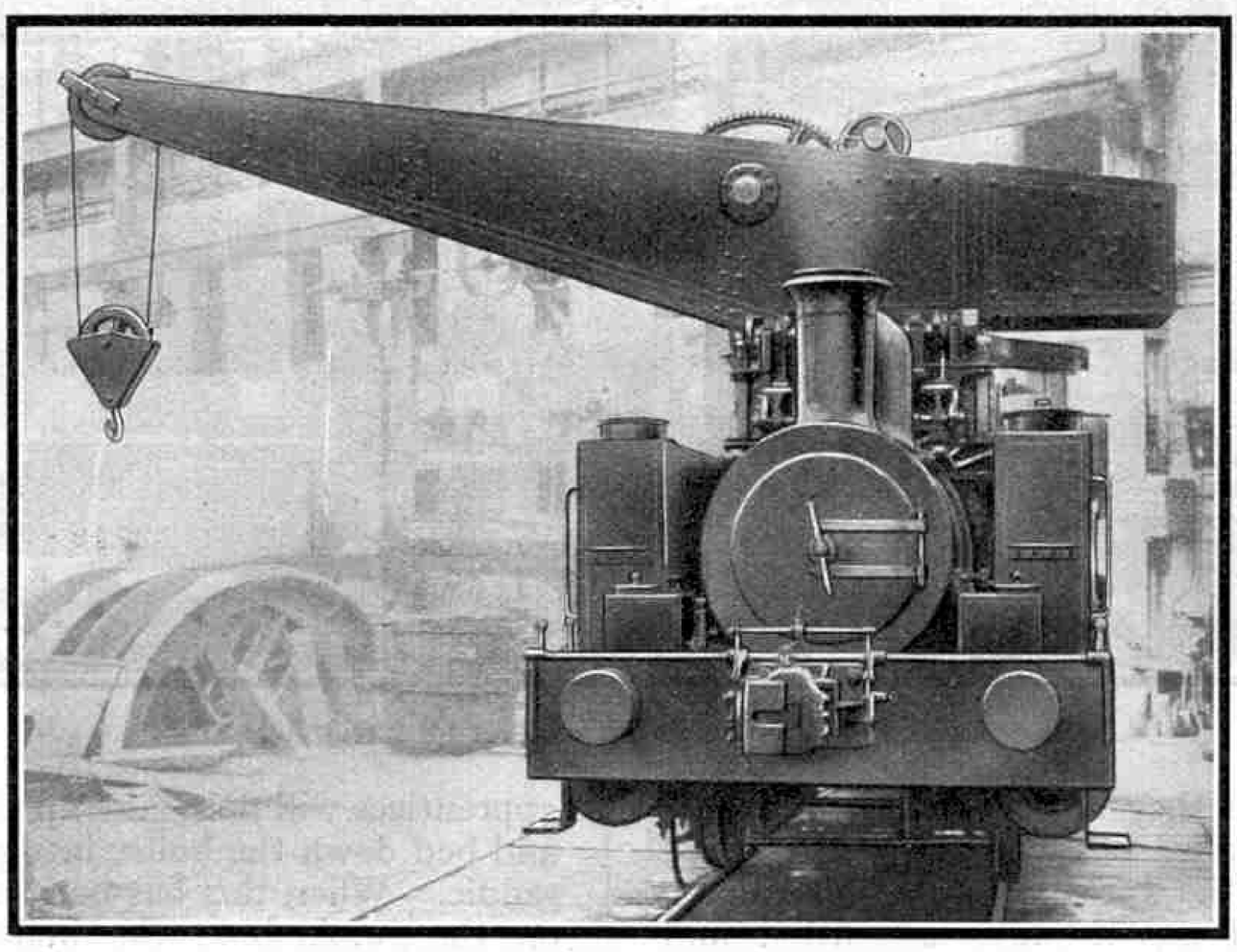
Photo] [*C. R. Woodward*

A typical "fireless" steam locomotive for use in places where the fire danger is great, or where smoke and fumes must be avoided.

While the apprentices are finishing off the smoke-box a cloud of blue smoke from the pit indicates that the "leading hand" is fitting up the motion. His pipe is drawing well, and the apprentice helping him is perspiring

freely, a sure sign that this is a " bonus job," that is, one for which a bonus is awarded when the work is finished in less than a specified time. Once the eccentric rods and the rest of the motion are coupled up the driving wheels are blocked up on rollers, and the valves are set—a very specialised job that cannot be described here. The boiler is now " lagged " or coated with asbestos sheets, which in turn are covered with $\frac{1}{8}$ in. mild steel sheets, painted the necessary colour and rolled to suit the curve of the boiler. All is now ready for fitting the saddle tank, which is waiting in the paint shop. It is taken over to the erecting shop where handrails are fixed, followed by the tank cocks and the lamp bracket. In order to do this a man has to go inside the tank to fit on the asbestos washers, which are covered with white lead to prevent water running out; and also to fit the nuts. It is not exactly an ideal job to get inside a tank that is plentifully besmeared with rust and white lead, and the man who emerges at the conclusion of the job is usually quaint in aspect and inclined to express his feelings rather forcibly!

The cab is now bolted into position, followed by the sand-boxes; and the sanding gear and the brakes are next fitted. The chimney follows. It is bedded down on to the tank, and the holes are marked off and drilled, and it is then slung into position and bolted down. The various copper pipes for injectors are now fitted, and the side rods are brought in from the finishing shop and coupled on. The oil siphons for lubrication are fitted into the oil cups, and after this the piston stuffing boxes and the valve spindles are packed in the usual manner. Now, after several days' labour, the locomotive is ready for the rail.



A 0-4-0 crane locomotive of standard gauge; the crane has a capacity of five tons within a 16 ft. radius.

A crane is coupled to the draw-bar, and draws the locomotive up to the telescopic chimney, which is lowered from the roof over the engine chimney. The boiler is filled, and afterwards the tank, and while the fire is being lit somebody busies himself with oiling up. Soon the pressure gauge needle begins to creep up until the red mark is reached. If the valves blow off at that point all is well; if not, the appropriate nuts must be tightened or loosened as the case may be until the pressure is sufficient to blow off just at the red mark. And now the fitting shop doors are open, and with a cheery whistle the engine moves off amid a cloud of steam to be " run in " in shunting wagons.

When everything is found satisfactory the fire is drawn, the gearing is dismantled, the axle-boxes are filled with oil, and a set of spanners, a hammer and a chisel are stowed away in the tool box. An L.M.S. shunting tank now appears and hauls our locomotive off to a goods train close by, to which it is coupled up like an ordinary wagon. A " leading hand," usually one who has been employed on building the engine, travels with it to its destination and stays with it until it is working satisfactorily. The locomotive then disappears from our view to commence a long career of strenuous and valuable work.

Mention must be made of another type of locomotive built by Messrs. Barclay, and that is the fireless steam locomotive. The enormous development in recent times of explosive factories, ammunition depots, oil refineries, paper works and warehouses, in which the materials handled are either violently explosive or extremely inflammable, has created a demand for a safe motive power for shunting operations. For work in any such situation the ordinary steam locomotive is obviously out of the question on account of the danger of fire. There are strong elements of danger also in the employment of internal combustion engines, and even the apparently harmless electric motor is not entirely above suspicion. The ingenuity of inventors has produced a solution to this problem in the form of the fireless steam locomotive.

As its name indicates, the fireless steam locomotive has no fire. Thus sparks and cinders do not exist, and if the brakes and buffers are covered with some non-sparking material the fire danger is practically eliminated. In addition there is no danger of explosion.

The principle on which the locomotive works is very simple. What appears to be a boiler of unusually large diameter is really a cylindrical tank known as a " receiver," the greater part of which is filled with water. The receiver has rounded ends and is fitted internally with special steam distributor pipes and numerous surge plates. The steam supply is obtained from a stationary boiler. At the front of the locomotive, above the buffers, is a short length of piping for attachment to the inlet valve, which is usually of a special spherical-jointed type that allows considerable variation in the position of the locomotive when being presented for charging. The water in the receiver is heated up until the maximum working pressure, usually 160 to 200 lb. per sq. in., is obtained. The charging operation is now complete, the inlet valve is closed, and the locomotive is disconnected from the charging boiler. The time normally required for charging when hot from, say, 15 lb. per sq. in. to 160 lb. per sq. in., is from 15 to 20 minutes; and the initial charging from cold—which need only be done at long intervals after the locomotive has been out of commission for ten days or more—requires only about $3\frac{1}{2}$ hours.

When the regulator is opened, steam passes from the dome to the cylinders, just as in the case of an ordinary locomotive; and after doing its work escapes through the exhaust muffle with a faint " puff." If fully charged the locomotive will perform ordinary shunting and general haulage work for three or four hours. Boosting charges can be given rapidly and whenever convenient. The power is naturally not so great as that of an ordinary locomotive of the same dimensions, as the working pressure of the fireless locomotive falls gradually as steam is used. Work in the factory or wherever the locomotive is situated is very frequently arranged in such a manner that the charging is carried out during the midday meal hour. This is of course an economical arrangement and the maximum service is obtained from the locomotive.

The fireless locomotive is really a steam accumulator. During the working period a portion of the water in the receiver evaporates, forming the steam for driving the locomotive. This is due to the fact that, with water and steam in contact under pressure and at corresponding temperatures, if the water be relieved even slightly in pressure a certain amount of heat is liberated, generating steam until thermal equilibrium is established. This process continues until the pressure falls too low for further work, say about 25 lb. per sq. in.; at which pressure the locomotive is able to run light for quite a long distance to the charging station.

When steam enters from the outside boiler it is condensed in the cooler water of the receiver, and it gives up heat to the water until the steam pressures in both boiler and receiver are approximately equal. This is the reverse of the evaporating process that takes place during the working of the locomotive, and it results in maintaining approximately the same level of water in the receiver after charging. The receiver is elaborately lagged with asbestos so that the loss of heat through radiation is practically negligible, and thus as steam is used by the regulator more is generated to take its place. If the locomotive should not be needed for a period of up to three or four hours it may be left without supervision, and during that time there will be no appreciable falling in pressure.

The fireless locomotive is ideal for shunting where moderate loads are to be handled and the gradients are not excessive. In addition to its use in munition and other factories it is finding increasing employment in factories where cleanliness is an absolute essential, and in which, quite apart from the fire danger, ordinary locomotives could not be used on account of smoke and fumes. There is little doubt that fireless locomotives have a great future in jute, cotton and paper mills, biscuit factories, power stations, dye works, margarine works, soap works and oil refineries, and a variety of other industries, for they can be safely run into and through any building no matter what manufacturing operations may be in progress.

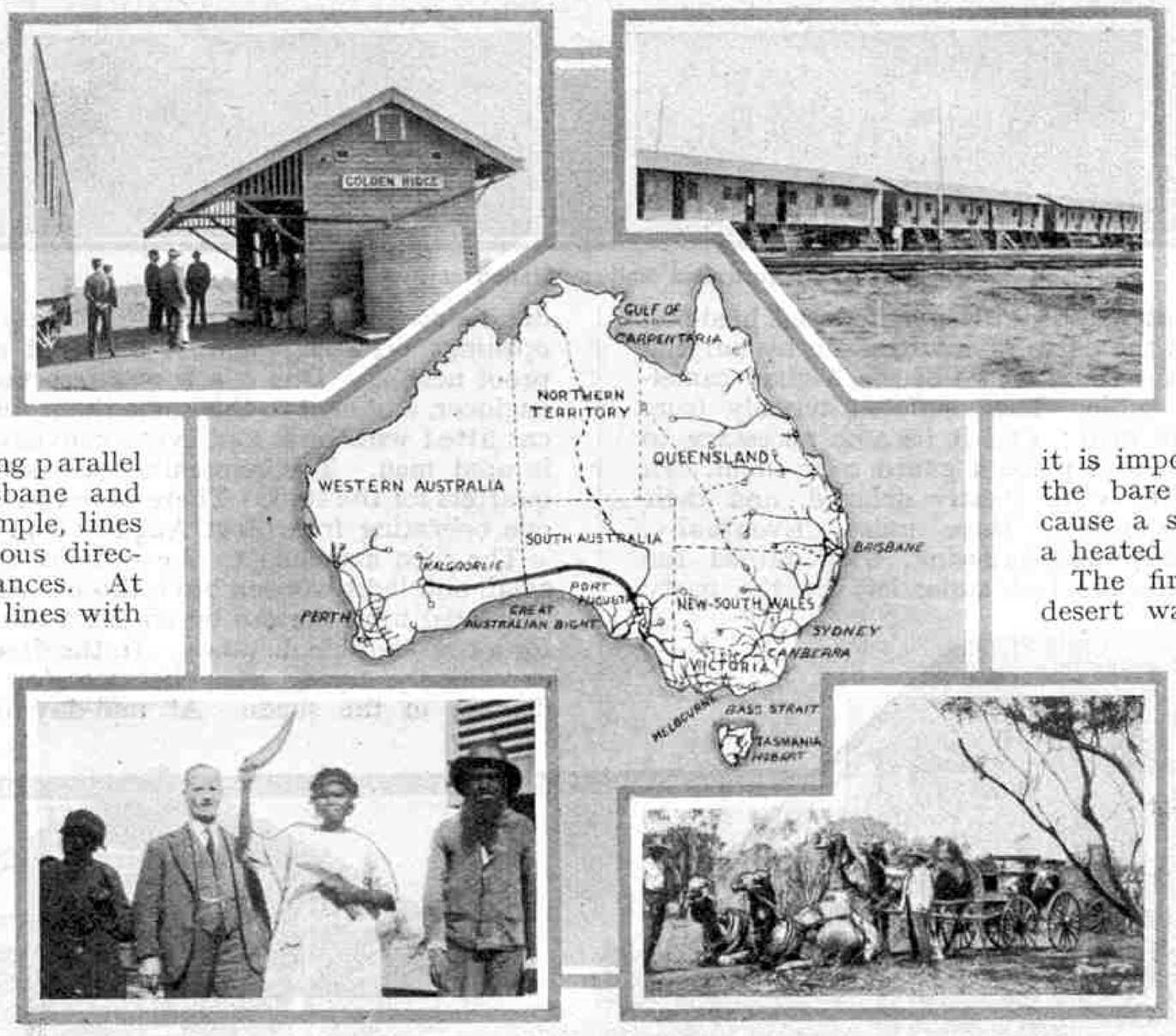
Conquering an Australian Desert

A Great Triumph of Railway Engineering

THE story of Australia's first trans-continental railway is a remarkable instance of the pluck and daring of the engineer and of how the desert places of the earth may be conquered and, partially at least, rendered habitable and of service to man.

The first railway operated in Australia was opened in 1854 by the Melbourne and Hobson's Bay Railway Company, and it ran from Flinders Street towards Port Melbourne. From this modest two-mile line there have been gradually built up extensive systems of rails varying in gauge from 5 ft. 3 in. down to 2 ft. 6 in. or even less, according to the ideas of the different States.

Generally speaking these systems are more or less coastal, but where the development of special areas has called for transport facilities long branch lines extend into the interior. Thus in the Eastern, South-Eastern and Southern districts of Australia we find a considerable network of lines converging from the various mining, pastoral and agricultural areas toward the ports, which in turn are connected by lines running parallel to the coast. From Brisbane and Sidney in the east, for example, lines stretch out inland in various directions for considerable distances. At Melbourne meet four main lines with numerous branches; and from Adelaide one main line with several coastal branches runs northward for nearly 700 miles, while another runs in a south-easterly direction to meet the main line from Melbourne at Serviceton on the border between South Australia and Victoria. In Western Australia there exists an extensive system of main lines serving the various mining and farming districts.



Centre-Map showing the course of the Trans-Australian line from Port Augusta to Kalgoorlie. Above—A typical wayside station, and some of the huts used during the building of the line. Below—Mr. E. G. Page, Australian agent for Meccano Ltd., with a group of natives, one of whom is demonstrating a boomerang; and on the right a constructor's camel-drawn wagon.

In spite of all these railway developments Western Australia remained isolated, and it was the knowledge of this isolation that led to the building of the Trans-Australian Railway, which gives through connection from one end of Australia to the other.

Western Australia was cut off from the other States of the Commonwealth by a barren and inhospitable region over a thousand square miles in extent, known as the Victoria Desert. It is one of the most arid tracts on the face of the globe, and no-one ever attempted to cross it, for the journey meant death. The people of Western Australia could only visit their neighbours in South Australia, the nearest State, by taking a sea-trip of several days' duration. Even this means of connection would have been closed in the event of Australia becoming involved in war and temporarily losing the command of the sea. Western Australia would then have been entirely cut off, and it would have been impossible to move troops to her assistance from other parts of the Continent, on account of the terrible desert that intervened.

This was a serious position, and the late Lord Kitchener pointed out the fact to the Commonwealth Government and advised the construction of the railway. At that time the rails had already reached Kalgoorlie in Western Australia, but between this point and Port Augusta in South Australia there lay over 1,000 miles of desert. Experts declared emphatically that any attempt to connect these two points by means of an iron road would be certain to end in failure; and cheerfully went on to prophesy that the route would be marked only by the bones of the would-be builders! Nevertheless the line has been laid, and thanks to wonderful organisation, scientific methods, and the splendid grit and determination of the engineers, the deaths can be counted on the fingers of one's hands. It must never be forgotten, however, that this involved a five years' battle against fearful odds.

Some idea of what faced the engineers when they set out to conquer Australia's most formidable desert may be gained when it is stated that in the whole of this vast region there is not a single stream or rivulet, or surface water of any kind. The region is hotter than the Sahara, the thermometer recording 140 degrees and more for days and even weeks at a time. Under the fierce and continuous heat the finger-nails split and the flesh, unless protected, soon blisters. The rocks and ground become so hot that at mid-day it is impossible to touch them with the bare hand. To do so would cause a scar just as if one gripped a heated iron.

The first explorer to cross this desert was Edward John Eyre, a Yorkshireman born at Hornsea in 1815, his father being a clergyman. He sailed as an emigrant to Australia in 1833, and his first experiences in Australian travel were received while driving herds of cattle overland to the coast. These journeys roused in him a keen desire to investigate the mysterious lands of Central Australia. He carried out successfully many hazardous trips, but the greatest of all was his famous journey, made in 1840, from Adelaide to the coast of Western Australia.

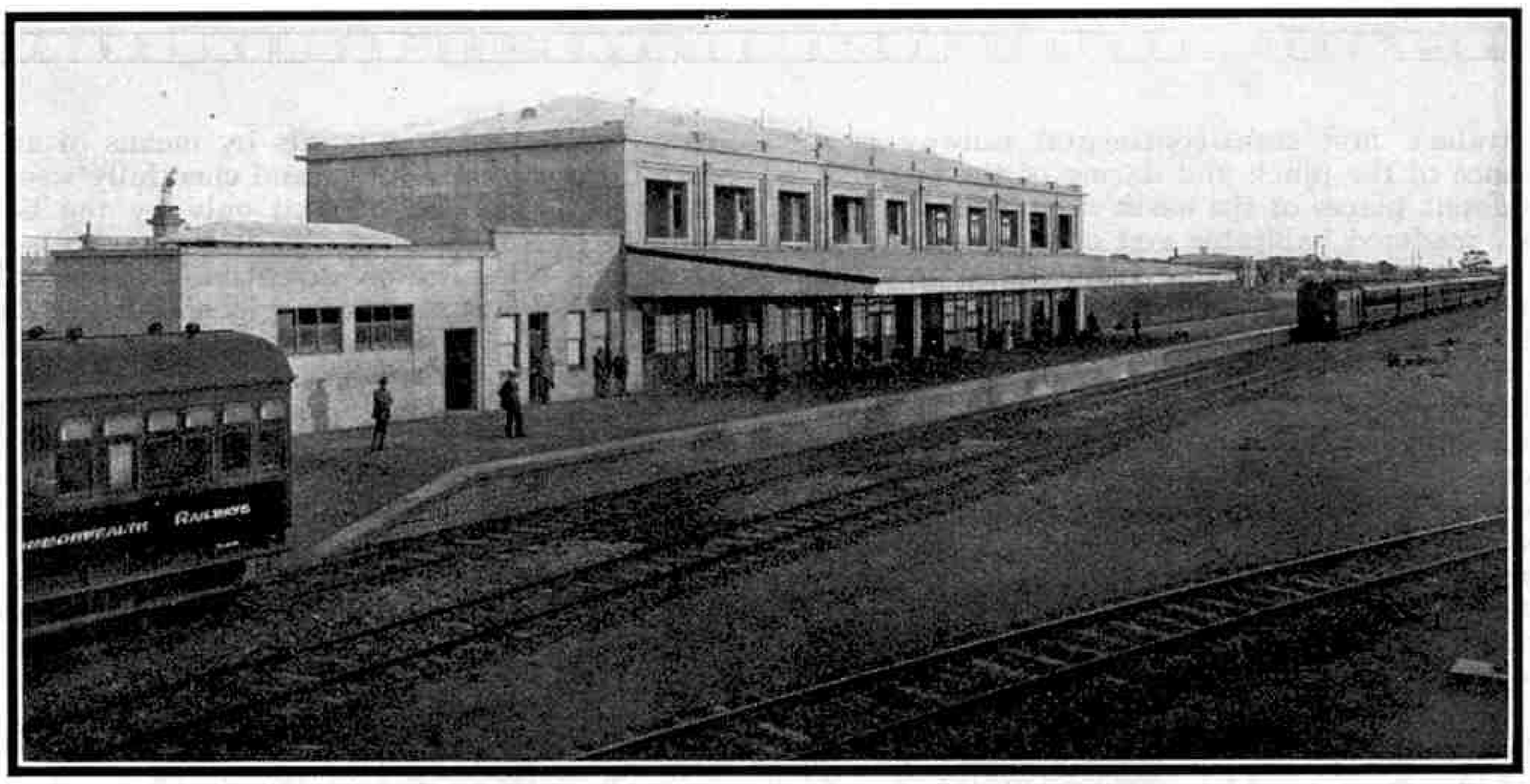
On this occasion Eyre was accompanied by one white companion and three natives. In spite of terrible sufferings from thirst the party struggled on until two of the natives became desperate through the fear of dying in the desert. One night these men killed Eyre's white companion and went off, taking with them as much food as they could carry. With 600 miles still to travel before safety was reached, Eyre and his remaining native companion struggled on through almost incredible hardships, and ultimately reached Albany in Western Australia over a year from the time they started.

It was across this region that the engineers now proposed to lay 1,000 miles of railway line. The first task was to map out the route, and this alone occupied two years and cost £20,000. The surveying party divided their force into two, one working eastward from Kalgoorlie and the other westward from Port Augusta. Each party had a force of 90 camels, these animals being selected because of their ability to go for long periods without water. They were called upon to carry the surveyor and his assistants, and also to haul the necessary water, stores, and stakes for locating the line.

In making the survey the chief engineer of each section went ahead of the main party. He ran the line by the aid of a compass,

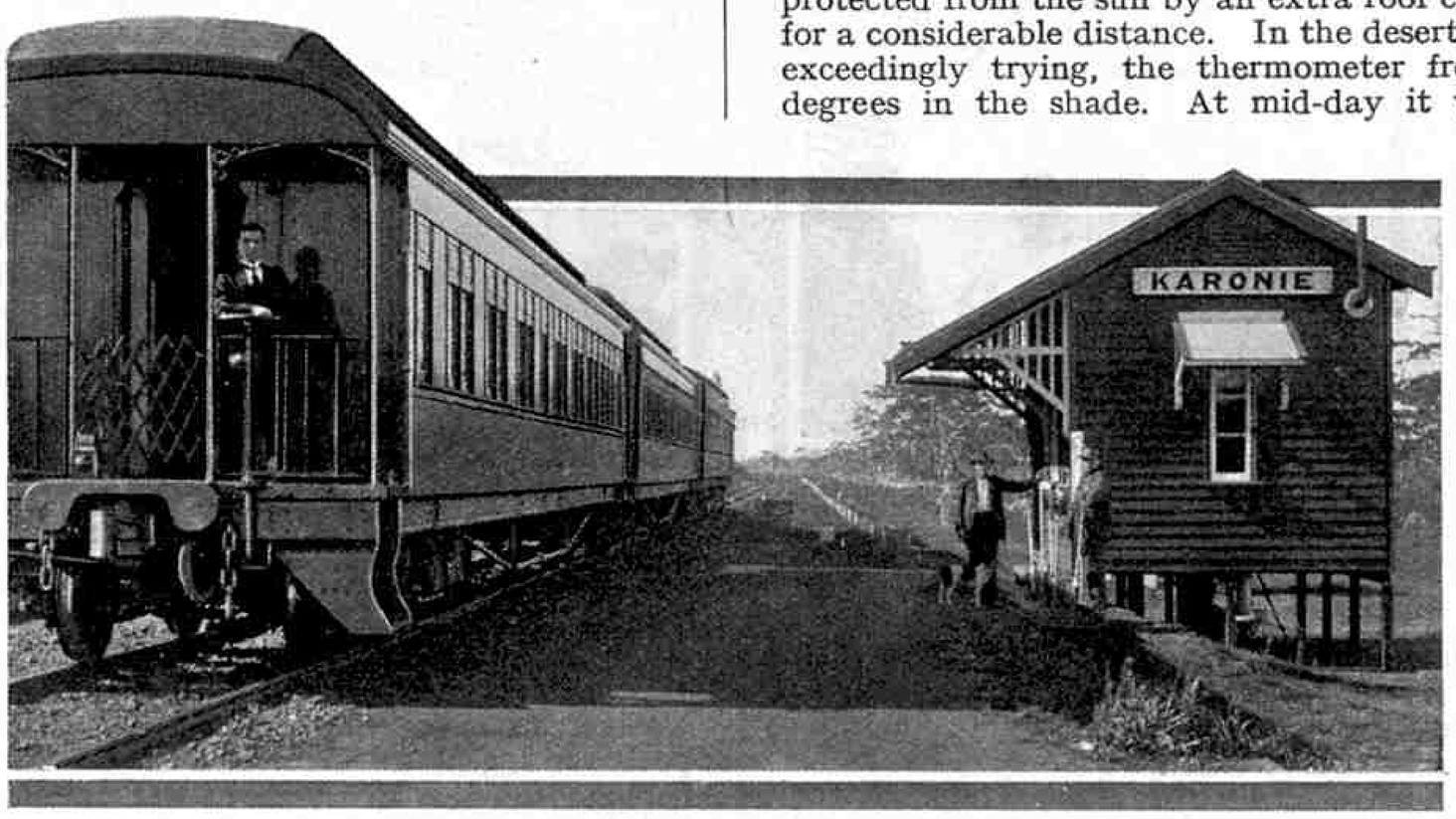
and checked his work by stellar observations. The last camel in his train was required to haul a heavy bullock-chain, the free extremity of which was knotted; and as this was dragged over the ground it left a trail that could be picked up and followed by the main party in the rear. The latter party measured the distance and took levels at frequent points, and these were constantly checked to ensure accuracy.

The Western party moved forward at the rate of about five miles a day and covered their 455-mile section to the inter-State boundary in 89 days. The eastern party were called upon to cover 654 miles, and they certainly experienced a more trying time than their fellow-workers. They were caught by an exceedingly hot summer, and the leading engineer records how it was impossible to use ink as it instantly dried on the pen, while the leads dropped out of the shrivelled pencils! Even the camels suffered terribly from the heat, and at mid-day the parched and blistered men had to take refuge from the fierce rays of the sun by burying themselves deep down into the sand. Two of the Afghan camel-drivers gave considerable trouble. They suffered terribly from sunstroke, which drove them mad; and it became necessary to strap them on to the camels and place a guard over them. In consequence of this the party were greatly delayed, and their average daily movement was only three miles. Eventually, however, after much hardship and suffering, they gained the boundary line and picked up the last stake left by the party that had advanced westward from Port Augusta.



The Trans-Australian Railway Station at Port Augusta.

Now came the question of the gauge for the "desert" link, as the line from Kalgoorlie to Port Augusta is termed. The recognised standard gauge of 4 ft. 8½ in. was finally decided upon, but only after a warm discussion in the Commonwealth Parliament. There is no single country where one finds so many different rail gauges as in Australia. Every State has a different one—a striking reminder of the foolish policy adopted by jealous States in the old days with the object of closing their boundaries to the traffic of their neighbours.



A stopping station for the Trans-Australian Express; this photograph gives a good idea of the design of the coaches.

The gauge having been settled, preparations were now begun for the laying of the steel rails simultaneously from each end across the desert. Leaving Port Augusta, the route lies for 42 miles through sandstone country, and then it enters what is called the Nullarbor Plain, a vast empty limestone plateau. Across this plain the railway now runs in one straight line for 330 miles—the longest run of dead-straight track in the world.

It was evident to the engineers that the water supply would form a very serious problem. Fresh water would be needed not only for the men during construction, but also for running the railway after it was built. After an exhaustive study of the conditions it was decided to take water from the big Mount Charlotte tank at Kalgoorlie and convey it along the line in pipes for delivery to locomotives from water-tanks situated about 50 miles apart, for a distance of 400 or 500 miles. The remaining part of the route runs through sandhill country, and at intervals there are natural rock-catchments. Here water was to be collected and stored in reservoirs and used as required. No part of this country has an average rainfall of more than ten inches, while the average for the whole is probably less than four inches a year.

The steel ends at Port Augusta and Kalgoorlie became busy centres of activity as railway material and stores were collected ready for the march forward into the desert. Hundreds of camels were requisitioned for transport work, as well as scores of mules and motor-cars. The camel proved the ideal beast for working in the desert, and the motor-car was very serviceable over the flat country where the sand was not too soft. The engineer and his staff resided in camp-trains, which moved forward as the rails were laid. These trains were specially designed for use in the desert, and consisted of as many as seven or ten coaches, with a double roofing to keep out the intense heat and all windows and openings protected against flies and other insects by mosquito-proof netting. One coach was reserved as an office for the head engineer, and next to this came the stores car, followed by a hospital car fitted with beds and every convenience for attending sick and injured men. The remaining cars served as living and sleeping quarters for the staff. There were two of these "towns on wheels," one operating from Port Augusta and the other from Kalgoorlie.

The men attached to the running staff were accommodated in small and light wooden huts, those used for sleeping quarters being protected from the sun by an extra roof carried down over the hut for a considerable distance. In the desert the heat was terrific and exceedingly trying, the thermometer frequently registering 130 degrees in the shade. At mid-day it was often impossible to work, for everything, including the sleepers and rails, was quite hot to the touch. The huts and all the dwellings were so constructed that they could be transported bodily by rail from place to place. Thus the camps were continually being moved as railhead advanced, and they seldom remained in one spot for a greater period than three weeks.

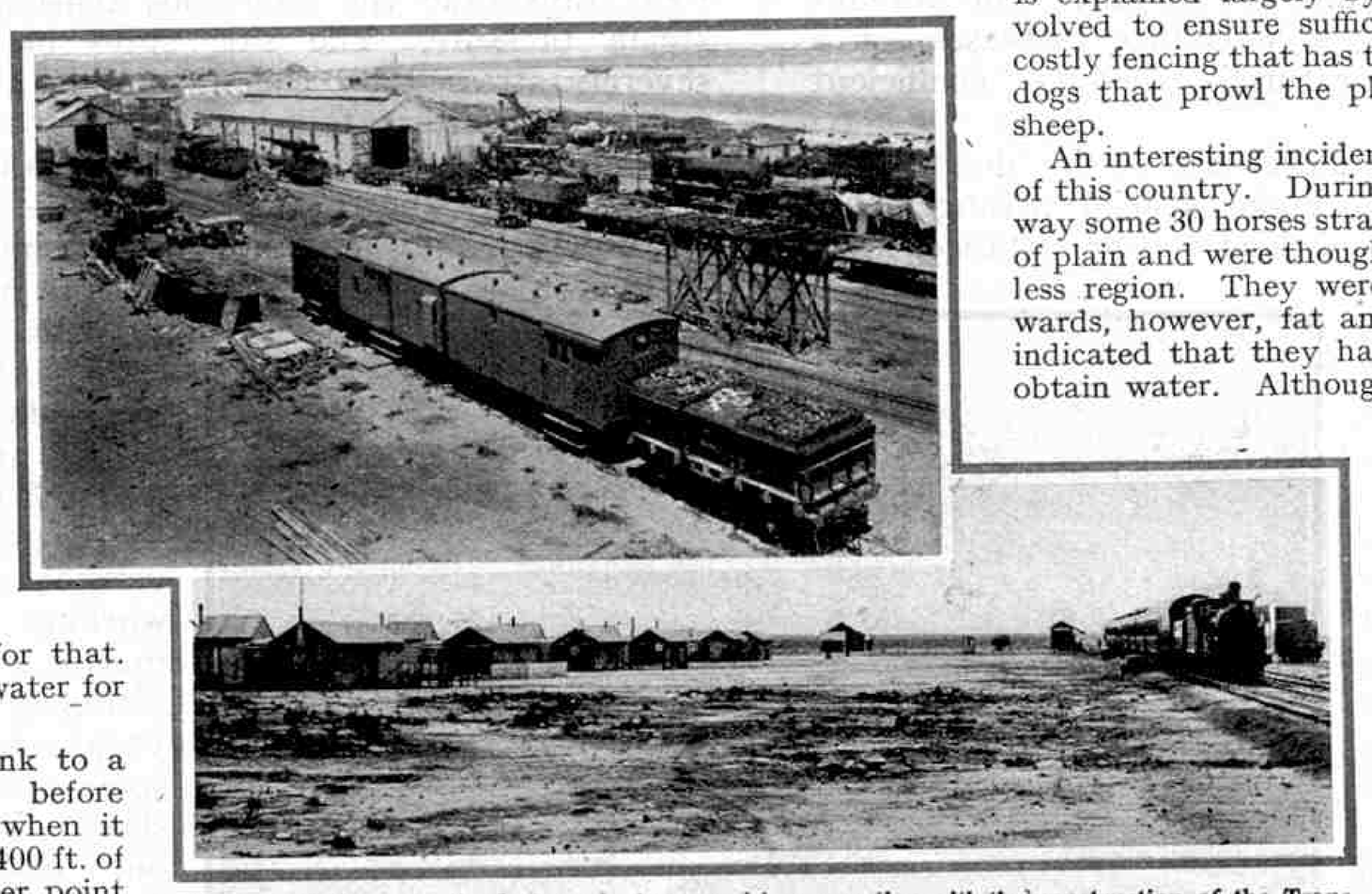
The engineers realised from the first that their greatest enemy would be the intense heat. Accordingly a medical expert skilled in diseases and complaints caused by heat accompanied each party, and was assisted by a couple of specially-trained nurses. The moment a man was overcome by the heat he was hurried to the hospital-car, where he received prompt medical attention. It was a common occurrence during the height of the summer for a dozen or more men to be lying on bunks in this car, with their heads wrapped in iced bandages.

As the country over which the railway ran was for the most part flat, it was simply a case of making an even bed. On this the sleepers were quickly laid, and across them the steel rails were placed by a track-layer. This is an ingenious mechanical device, mounted on a truck, which is pushed by a locomotive to the very end of steel. At its two extreme ends are long overhanging arms, which grip the rails carried on the truck, swing them outward over the track, and lower them on to the sleepers in the desired position, when they are at once spiked and bolted. By means of this

machine the track moved forward at the rate of about a mile a day.

Water for the camps was brought up daily by camels, but it was necessary to make provision for supplying the locomotives when the railway would be running. The party working eastward from Kalgoorlie laid special pipes from the reservoir there, and at every 50 miles or so tanks were built into which water could be pumped and stored until wanted. Then one day the good people of Perth were astonished to hear that the engineer had telegraphed for a complete artesian boring plant to be sent out. The old miners and those who knew the land laughed at the very idea of water being found in that withered-looking country lying behind the great Australian Bight. When Eyre crossed this dismal desert he went for 700 miles without finding as much as a tumblerful, and all subsequent attempts to obtain any by sinking bores had failed. One might, said the old hands, as reasonably look for figs on thistles as for artesian water in that soil.

The machinery was sent out, however, and shortly afterward the whole of Australia was thrilled by a telegram announcing that, at a point 350 miles from Kalgoorlie, on the dreary Nullarbor Plain, water had been found! "I baled out 70,000 gallons of water," said the engineer in his telegram, "from the bore sunk at the 127th meridian of longitude, and then took samples. The water is of good quality, no salt, a little hard; but I think the iron in it would account for that. It should be good water for boiler purposes."



Above—Port Augusta, the first repair shops used in connection with the construction of the Trans-Australian Railway. Below—One of the tiny hut colonies scattered along the waste of the Nullarbor Plain, across which the railway runs in a perfectly straight line for 330 miles.

The bore was sunk to a depth of 1,300 ft. before water was struck, when it welled up to within 400 ft. of the top. At another point 100 miles farther on brackish water, but usable for locomotives, was again struck at a depth of 900 ft.

This discovery of water not only relieved the engineers of considerable anxiety and greatly lessened their work, but also it has rapidly changed the aspect of the country. Out on the Nullarbor Plain, hitherto regarded as valueless, hundreds of thousands of sheep are being successfully raised. It is the opinion of Government experts who have surveyed the region that it will develop into a great grazing country, carrying at least three million sheep. The finding of water has made all the difference.

It should be mentioned here that although the wells and bores along the route afford unlimited supplies of water, the presence of certain constituents that are very injurious to locomotive boilers makes it necessary for the water to undergo special treatment before it is introduced into the boiler. The ordinary lime and soda processes that are used successfully elsewhere were found ineffective in counteracting the corrosive agencies in the water, but after years of experiment and inquiry throughout the world there was introduced a process known as the "Edquist" treatment, which utilises barium carbonate and caustic lime. This method, which was first successfully exploited by the Sons of Gwalia Mine in Western Australia, not only prevents corrosion but also removes from the water its very troublesome scale-forming properties.

When the water problem had been solved satisfactorily the construction of the railway was pushed forward with the greatest possible rapidity. Ultimately, when the railheads were within sight of one another and levels were taken, it was found that the surveys were less than a quarter-of-an-inch out. This means that if each party had continued its work the rails would have met except for that small fraction of distance!

The country traversed by the Trans-Australian Railway has been described as the "Australian Wonderland," and it well deserves this name. It is the domain of the kangaroo, the emu and the wild turkey. The barking lizard, the kangaroo mouse, the sand mole, the cave owl, and the great wedge-tailed eagle with a 10 ft. spread of wing, are some of the unique denizens of this primitive land, where the naked aborigine still holds mile upon mile of rolling plain, undisturbed by the white intruder.

On the great Nullarbor Plain, where the line runs as straight as a parallel of latitude for 330 miles, the smoke of a train is visible 45 miles away. Station-masters are as far as 202 miles apart! In whichever direction one looks, the shining rails run on towards infinity until they seem to melt into one another in the dim distance; while the plain rolls away to a circular horizon such as one sees from a ship when out of sight of land. By day the sun shines in a sky of cloudless blue, or at most flecked by a few white clouds; and beneath it lies the circle of earth, unbroken by hill or valley, tree or house, or any of the features that we are accustomed to in ordinary landscapes.

This strange country differs from most other arid zones throughout the world in that it carries a natural perennial vegetation, which somehow manages to thrive under the difficult conditions, and provides safe pasturage for stock. This vegetation consists mostly of saltbush, bluebush, and mulga, the last-named being a tree that provides sustenance for stock at critical times when unusually long dry periods are experienced and other fodders are depleted. Sheep and cattle thrive in this region so long as adequate water is available. A vast area still awaits development, and the slow rate of settlement is explained largely by the considerable outlay involved to ensure sufficient water supplies, and the costly fencing that has to be provided against the wild dogs that prowl the plains and prey on defenceless sheep.

An interesting incident illustrates the grazing value of this country. During the construction of the railway some 30 horses strayed into the unknown expanse of plain and were thought to have perished in a waterless region. They were discovered two years afterwards, however, fat and well, and their worn hoofs indicated that they had descended a steep slope to obtain water. Although it has never been explored, an underground river is known to exist between the railway and the coast; and the fact that these horses were able to obtain water indicates that this mysterious subterranean river is accessible at some point by the descent of precipitous limestone cliffs.

The extent of the region covered by the limestone is as yet unknown; probably the plain has a total area of nearly 100,000 square miles. Not much is known of the geology of the region, but it is evident that where the plain now stretches the sea once rolled, and that subsequently, as the result of some stupendous upheaval, the sea bed was raised to dry land once more. This ancient sea floor retains so much of its original nature that the water it yields is as salt as that of the sea, or even salter; and much of the limestone is full of well-preserved remains of shells.

The water that falls on the surface is quickly absorbed by the limestone, and underground there is a network of caverns and passages. A remarkable feature of some parts of the plain is the "blowholes." These are more or less circular pipe-like openings in the crust of the earth, communicating with the underworld. There is evidently a constant circulation of air below, and at times a tremendous air current passes out of these blowholes, while at other times there is a strong suction.

Another strange feature of the plain is the presence on the surface, particularly on the more elevated parts of the limestone region, of pieces of natural glass—black, hard and glossy, and resembling the obsidian found in certain volcanic regions. How these fragments got there no one knows, for there is no volcanic country for hundreds of miles in any direction. It has been suggested that they have fallen as meteorites, and this theory is now largely accepted.

In spite of the nature of the country traversed, a journey by the Trans-Australian Railway is thoroughly comfortable in every respect. The passenger rolling stock used for the tri-weekly express service consists of first-class and second-class sleeping cars accommodating 20 and 34 sleeping passengers respectively. A dining car is provided on each train, and the purchase of a ticket for all meals during the journey is compulsory, the cost being included in the price of the rail ticket. A lounge car provided with easy chairs and facilities for writing and card-playing is coupled next to the dining car, and in this lounge coffee is served after dinner. At the ladies' end of the car is installed a piano. Each sleeping car is equipped with a shower bath and each compartment has an electric fan.

The cars are 76 ft. 7 in. in length, 10 ft. 6 in. in width and 14 ft. 6 in. in extreme height from the rail, these being the limits permitted by the standard rolling stock gauge adopted by the Australian Railways Commissioners. The "Sharon" centre coupler is standard on the Trans-Australian

(*Continued on page 168*)

Heat Expansion in Railway Engineering

By R. D. Gauld, M.Eng., A.M.Inst.C.E.

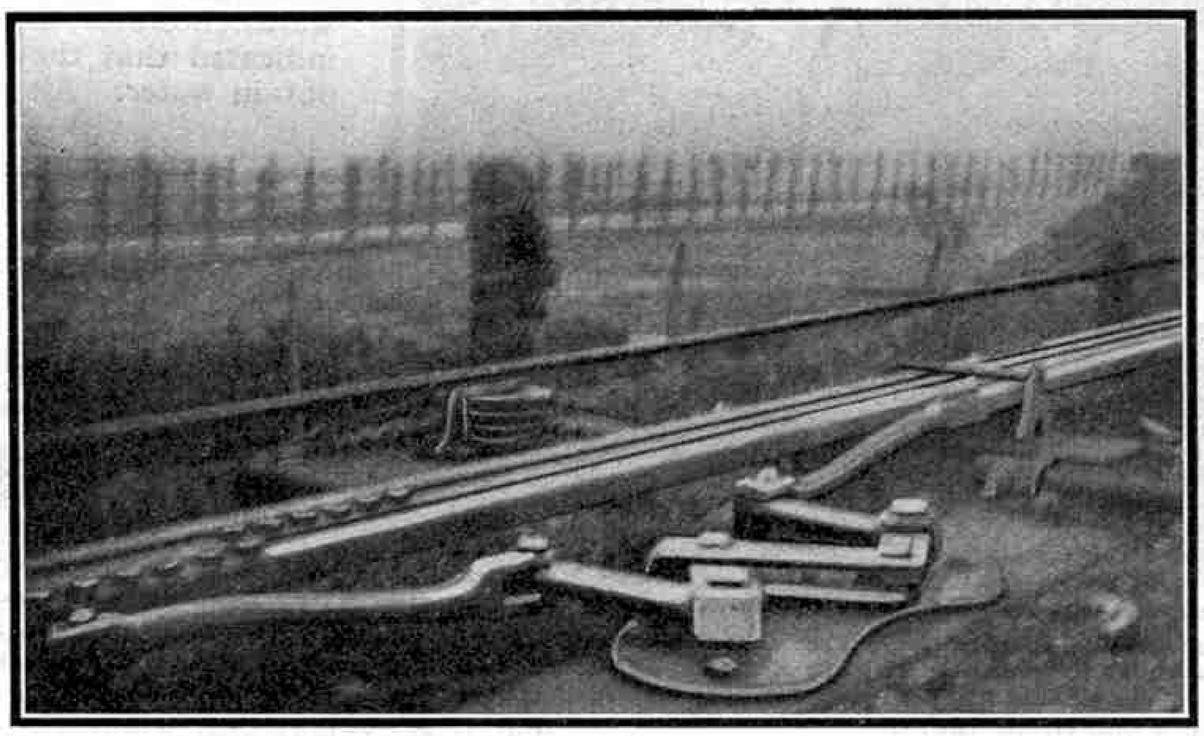
IT is common knowledge that when a piece of metal is heated it becomes larger, although unless its length is fairly great the increase in size may not be noticeable at ordinary temperatures. It has been found that the expansion is constant for any given rise of temperature for a particular metal, but that the amount varies with different metals. The amount by which unit length of a substance increases for a rise of one degree in temperature is called its "coefficient of expansion."

When long lengths of metal are to be dealt with, it is often necessary to make special arrangements to allow for this expansion effect. For instance, most readers will know that when rails are laid in a track they are not butted up tight to one another, but a space is left between the ends. Now that 60-ft. rails are coming into general use in this country the expansion spaces at rail joints have to be greater than they were for the 45-ft. and 30-ft. rails, which is one of the disadvantages of the longer rails. The actual space allowed depends upon the temperature at the time the rails are laid, and the gangers in charge of relaying work have standing instructions as to how much expansion to allow. They are not expected to take the actual temperature, but to use their discretion as to whether the day may be called very cold, cold, cool, warm, or very warm. The spaces are kept by small pieces of iron inserted between the rail ends, and removed when the joint has been bolted up. It will be clear that some allowance must be made for the expansion to occur by increasing the size of the holes in the rail ends. The fishbolt, of $\frac{15}{16}$ in. diameter, is a good fit in the fishplate, and is prevented from turning by having a pear-shaped neck to fit the pear-shaped hole in the fishplate. The holes in the rail, instead of being round, measure $1\frac{1}{16}$ in. in a vertical direction and $1\frac{3}{16}$ in. horizontally.

Owing to the expansion effect, a locomotive boiler is appreciably longer when hot than in its cold state. A boiler under steam may be $\frac{3}{16}$ in. to $\frac{5}{16}$ in. longer than if "dead," and hence it has to be fastened to the frames in such a manner as to allow for this. For this reason it is rigidly fixed at the smokebox end only. At the firebox end, angle iron brackets are fixed to the boiler, and the bottoms of these simply rest on the frames, but are not fixed to them. Free sliding of the boiler due to expansion and contraction is therefore possible.

The firebox of the locomotive is made of copper in this country, and the coefficient of expansion of copper is greater than that of steel. For this reason, and also because the inside of the firebox is much hotter than the outside, special arrangements have to be made to allow the firebox roof to rise and fall relatively to the rest of the boiler, at the same time that the roof stays take the enormous tension set up by the steam pressure. The side stays of the firebox are severely stressed by the expanding and rising of the walls, being alternately bent and unbent as the firebox heats up and cools down; and breakages are frequent.

The bars of the firegrate are made a loose fit in the grate when cold, to allow for expansion when hot.



Point rodding compensator, for compensating for expansion or contraction in the iron rodding between the points and the signal box.

But it is perhaps in signalling work that the most interesting expansion effects and applications are found. When a signal is fairly close to the signal box, the expansion of the wire for working it does not matter a great deal. For distances of, say, 200 yards and over, however, some means of taking up slack wire and letting it out again is necessary. Sometimes a device is fitted to the signal lever, consisting merely of a spring-loaded hook with a catch, which is pulled up or let down as required, thereby tightening or slackening the wire. For the longer distances some winding arrangement is usually necessary, and this is fixed either on the wall or on the floor. Fig. 1 shows a usual arrangement.

When the light of a signal cannot be seen by the signalman, it is necessary to have an indicator in the cabin to show whether the light is "in," or "out." This indicator is called a "light repeater," and its action depends on the fact that different metals have different coefficients of expansion. Two metals, say iron and brass, in the form of an iron rod in a brass tube, are rigidly connected at one end. They are fixed above the lamp burner so that they remain hot as long as the lamp is lit. A system of levers is connected to the free end of the rod, so that the small movement, relative to the brass, is multiplied several times. The end of the last lever forms a contact, and the apparatus is so adjusted that when cold the contact is broken, and the electrically-worked repeater shows "light out" and rings a bell to attract the signalman's attention. When hot, the contact is made and the repeater shows "light in."

It is in the working of the points, however, that expansion plays such an important part and requires such special precautions to be taken. The difficulty is that as the travel of the points is something less

than 4 in., it is essential that the length of the rodding between the signal box and the points should be kept as nearly constant as possible. With a temperature variation of 50° F., quite a usual figure in this country, a length of rodding of 300 yds. would vary in length by about $3\frac{1}{2}$ in. Hence the necessity for point rod "compensators."

The simplest arrangement for working points from a signal box would be to have a run of rodding connected as directly as possible to the points. When the lever was pulled, all the rodding would be in tension; and when the lever was pushed back to normal all the rodding would be in compression. It would be very difficult to compensate this arrangement for temperature, however. The general requirement in practice is that there must be as much rodding in "pull" as there is in "push." Fig. 2 will make this clear. Imagine two equal lengths of rodding, SC and RP; S being connected to the lever in the signal cabin, and P to the points. COR is a short lever pivoted at O, so that CO is equal to OR. Now if S is pulled 4 in. to the left, P will travel 4 in. to the right, and operate the points. If, however, the lever is not pulled, but we imagine heat to be applied to the rodding, C will expand to the right, but R will expand an equal distance to the left. The lever CR will therefore rotate slightly, but P will not move. Lever CR is therefore a "compensator."

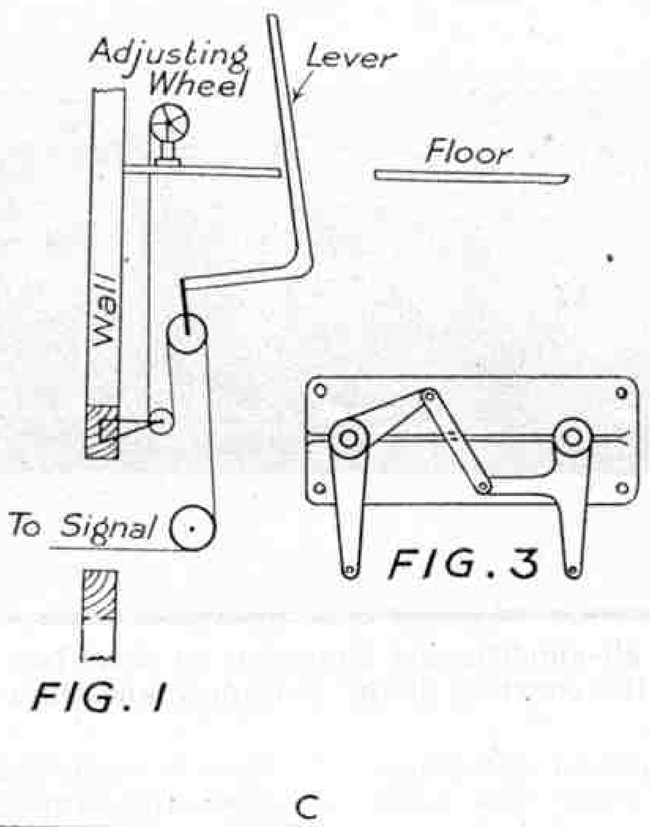


FIG. 1

FIG. 3

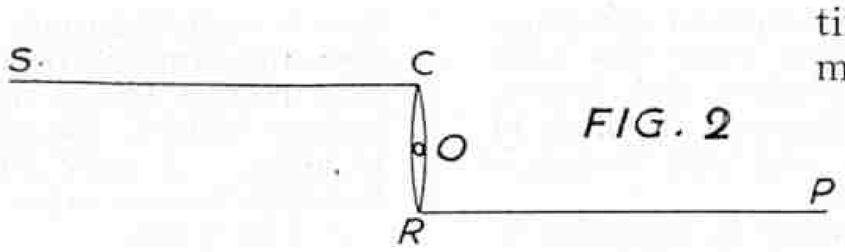


FIG. 2

Any arrangement that reverses the direction of motion of a run of rodding can be used as a compensator. The most usual device is a pair of cranks with a connecting link, the whole appliance lying flat on a piece of timber. Fig. 3 shows the layout of the compensator.

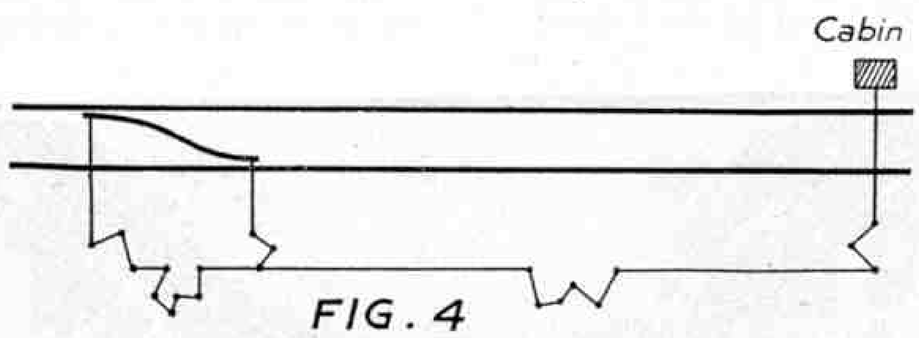


FIG. 4

So long as a lever works only one pair of points there is no particular difficulty in the compensation, but when it works two sets of switches, such as the two ends of a crossover road, the problem is not quite so simple. Generally speaking, the solution would be to fix a first compensator midway between the lever and the nearest pair of points; and a second compensator half-way between these points and the second pair (Fig. 4).

If some of the rodding were boarded over, as happens at places where shunters work regularly, it would be necessary to allow for the fact that the rodding so protected would have a less temperature range than that in the open. It should be noted that compensators are so designed as not to alter the amount of travel given to the rods, but only to alter the direction of that travel. Considerable skill is required in setting compensators when first installed, to make sure that the whole run of rodding will work smoothly at all likely temperatures.

In the design of structural steelwork the engineer has to make due allowance for the expansion effect of heat. In long carriage sheds, for instance, it is arranged that at certain intervals, decided by experience, special expansion joints are provided, usually by allowing the bolts to work in slotted holes. Even in reinforced concrete structures, when these are of considerable length, it is usual to make expansion joints to prevent the formation of "temperature cracks."

In steel bridges up to about 40 ft. span it is not usual to make any special provision for expansion. For longer spans, say up to 70 ft., it would be sufficient to bolt down one end of the girders as firmly as possible, leaving the other end to slide on a specially-planed bed-plate. Over 70 ft. span, and up to about 120 ft., it is usual to supply what are called rocker bearings, special castings with a rounded under surface being fixed under the girders near their ends, and bearing on flat plates. These permit the girders to change length by a slight rise or fall in level at their centres. For still longer spans, roller bearings would probably be used, in which the girder actually bears on a number of rollers that allow free movement.

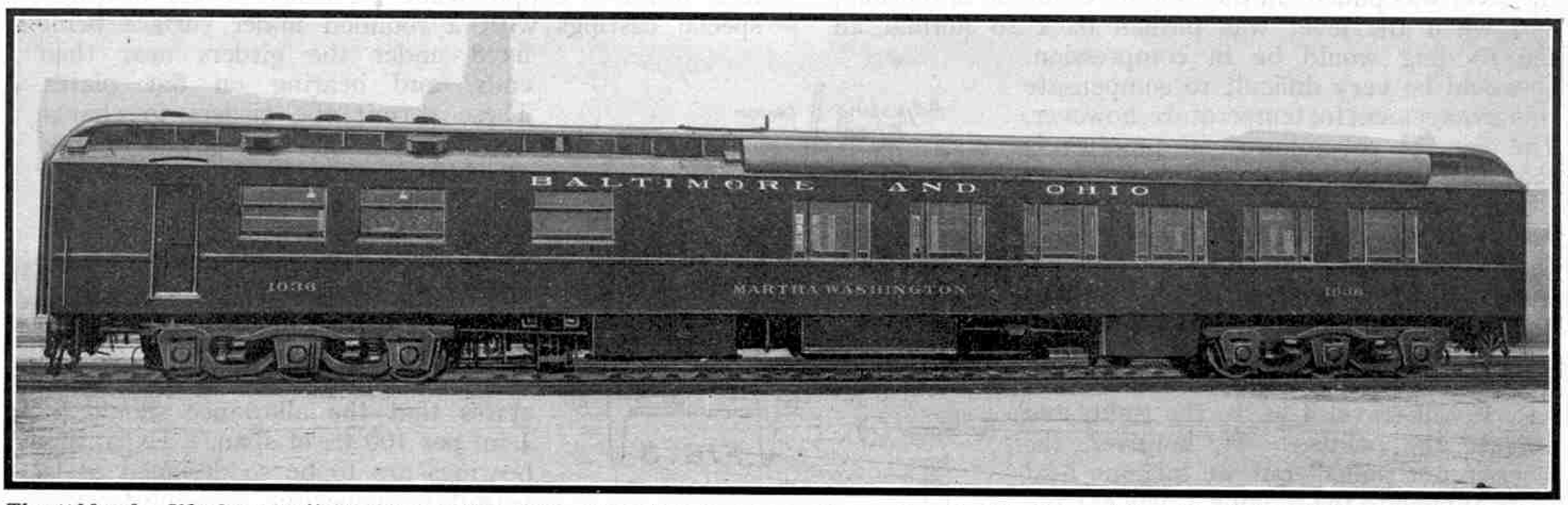
The British Standard Specification for Girder Bridges lays down certain rules for dealing with expansion, and states that the allowance should be 1 in. per 100 ft. of span. Expansion bearings are to be so designed as to permit of inspection and lubrication, and are to allow free movement in a longitudinal direction, at the same time preventing any transverse motion. When the span is above 100 ft., bearings are to be provided at both ends of the main girders to permit deflection of the girders without unduly loading the faces of the abutments or piers.

In exceptionally long steel bridges, such as the Forth Bridge, expansion is very troublesome. For that bridge a range of $\frac{7}{16}$ in. per 100 ft. has been found, and as each of the cantilever arms measure 1,700 ft., the total possible expansion of the bridge amounts to several feet! It becomes necessary to make special allowance for this in the permanent way by making some of the rail joints on a long slope, instead of square across the rail. The effect of strong sunshine on the Britannia Tubular Bridge over the Menai Straits is to cause the box girders to rise in the middle and also to bend sideways, but the actual movement can of course only be detected by accurate measurements.

Railway engineers are often concerned with the maintenance of warehouses and similar buildings, as most of the companies are extensive owners of such property. Some of these buildings are very old, and bulging of the outer walls sometimes occurs which, unless stopped, would increase gradually until it caused a collapse. One way of preventing further bulging is to tie two parallel walls together by iron tie rods, which pass through the walls and have screwed ends. Large washer plates on the outside take the pressure of the nuts that are threaded on to the screwed ends. The tie rods are heated to make them expand, so that they push further through the walls and enable the nuts to be screwed up more tightly. Then, as the rods cool down and contract, they draw the walls together.

Air-Conditioning in Railway Cars

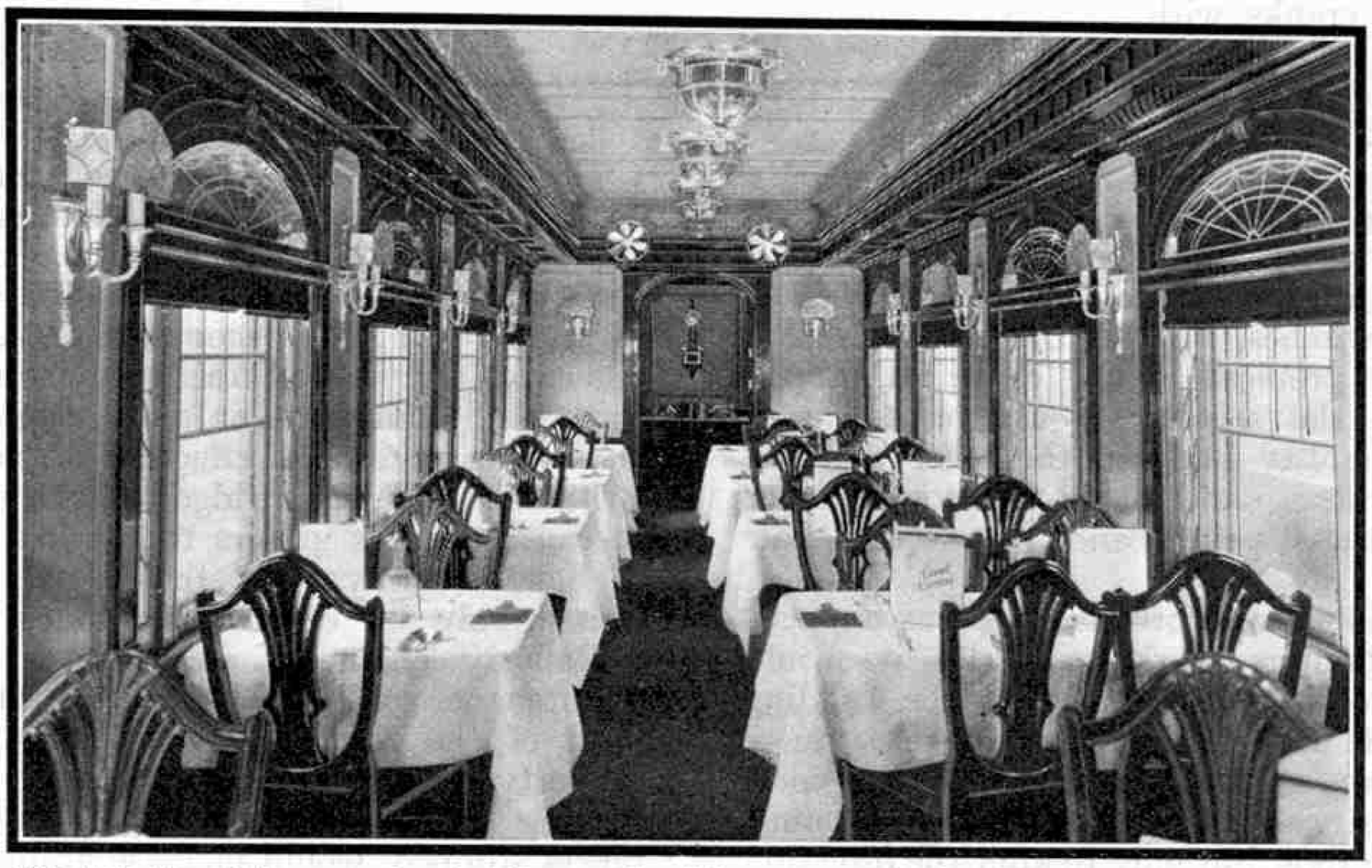
American "Weather-Making" Experiment



The "*Martha Washington*" dining car fitted with air-conditioning apparatus as described in this article. For this and the other illustrations we are indebted to the courtesy of the Baltimore and Ohio Railroad Company.

ONE of the most notable features of the development of railway passenger accommodation during recent years has been in the direction of ever-increasing comfort and luxury. Coaches that at one time were considered to reach the limit of luxury have been completely surpassed, and still designers continue their efforts to attain perfection.

One of the latest phases of this development is embodied in the air-conditioning apparatus fitted to one of the dining cars in the service of the Baltimore and Ohio Railroad of the United States. By means of this apparatus it may be truthfully said that the atmospheric conditions inside the car may be adjusted to suit the requirements of the passengers at any period of the year and during any kind of weather. The Baltimore and Ohio Company carried out preliminary experiments in one of their coaches with air-conditioning apparatus commercially available at the time, but not designed specially for the requirements of railway service. Subsequently the company decided to instal a specially designed apparatus in one of their dining cars, the "*Martha Washington*," and a test run was made with this car in a regular train from Baltimore to Cumberland on 14th April this year.



The interior of the car, showing the overhead louvres on the half deck through which the purified air is circulated.

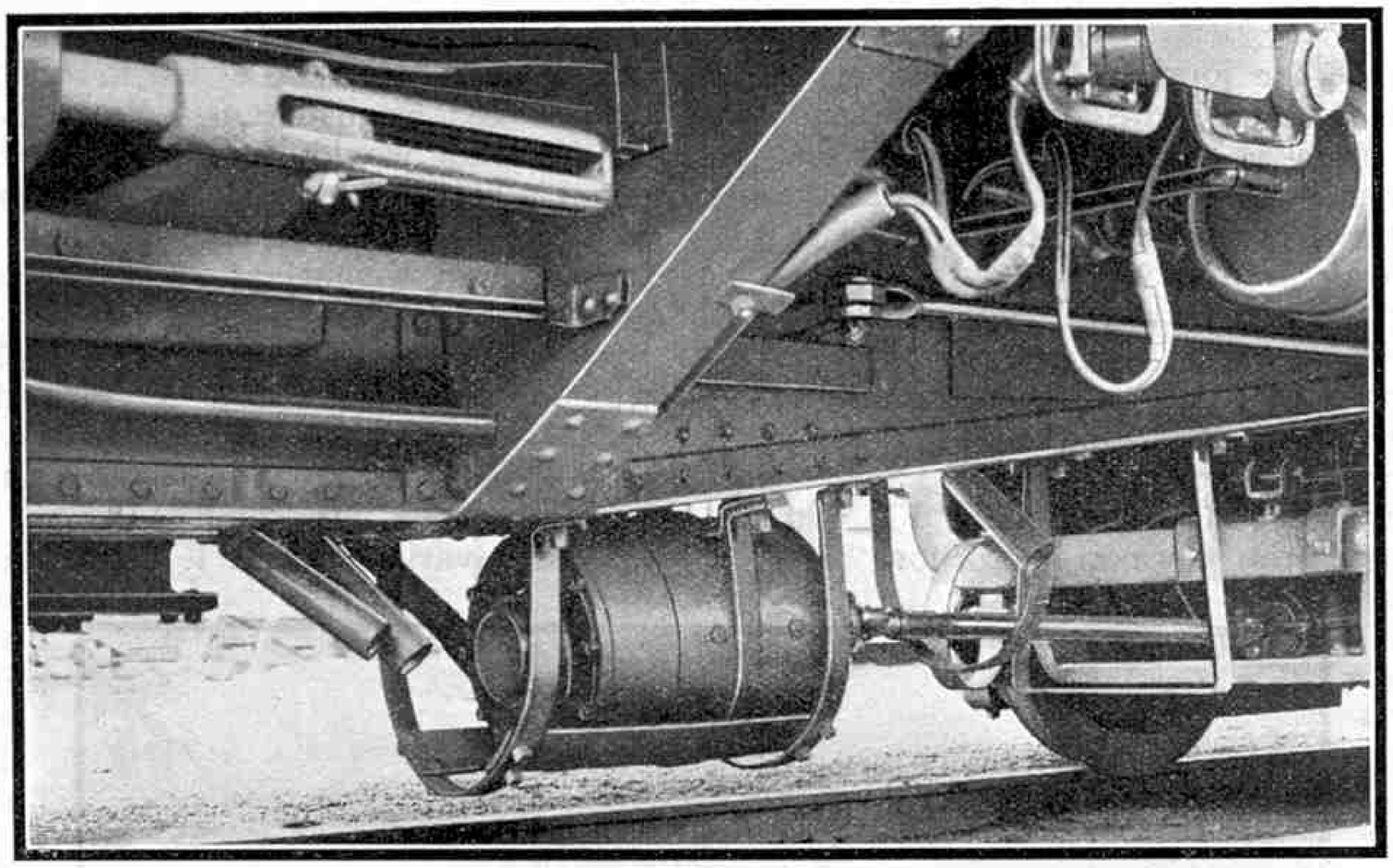
The test to which the apparatus was subjected was purposely made as severe as possible. The full heating capacity of the car as used in winter was turned on so that the temperature—which was further augmented by heat from the kitchen stoves and the already warm outdoor weather—rose to 93 degrees. The new apparatus was then set in operation, and within 20 minutes the temperature inside the car had dropped 23 degrees, that is more than one degree per minute. In less than half an hour the atmospheric conditions changed from mid-August heat to a normal Spring mildness; and thus, for the first time in railway history, the temperature in a passenger car was made to order. A week after its final test trip the car was running in regular service as part of the "*Columbian*" between Washington and New York.

The new system not only makes it possible for the air in the car to be cooled as desired, but also it reduces to the minimum any humidity or "stickiness" in the air. At the same time all traces of dust, smoke and cinders are eliminated from the air that circulates throughout the car. The control of the apparatus is automatic and it can easily be set by the steward in charge of the car. The cooling equipment as well as the running gear of the car is insulated with rubber cushions and pads so that full operation of the equipment is accomplished without any noise or vibration.

The manner in which the system works is very interesting. A certain amount of outside air is admitted to the car through air filters placed at the roof line. These filters are mechanically operated and are of a commercial type filled with steel wool that prevents dust, cinders and any other undesirable matter from passing into the car. The air is then cooled to the required temperature by passing it over cooling coils which have a total surface of about 600 sq. ft. It is then handled by two fans and distributed through a system of overhead insulated ducts and delivered to the interior of the car through louvres in the half-deck on each side. It is a notable achievement that this is accomplished entirely without draughts.

Equal distribution of the air throughout the car is obtained, and the air is re-circulated and supplemented by a certain amount of outside air, the quantity depending upon atmospheric conditions. It has been found by experience that during extremely warm weather the most comfortable conditions are obtained when the temperature inside the car is from 10 to 15 degrees below the outside temperature.

The water used in the condenser is delivered by a motor-driven pump to a cooling tower, or spray unit, at the end opposite the kitchen, where fresh air drawn from outside is passed through the water spray. Then the temperature of the condenser cooling water is brought back approximately to that of the outside air, after which the water is available for re-circulation. Provision has been made for automatically replenishing the water evaporated in the cooling tower, this being accomplished through a float-controlled valve connected with an overhead supply tank. If the temperature of the cooling water should tend to become too low, which might result in the freezing of the water in the evaporator, the back pressure valve in the ammonia system automatically cuts off the supply of ammonia and thus prevents further lowering of the temperature.

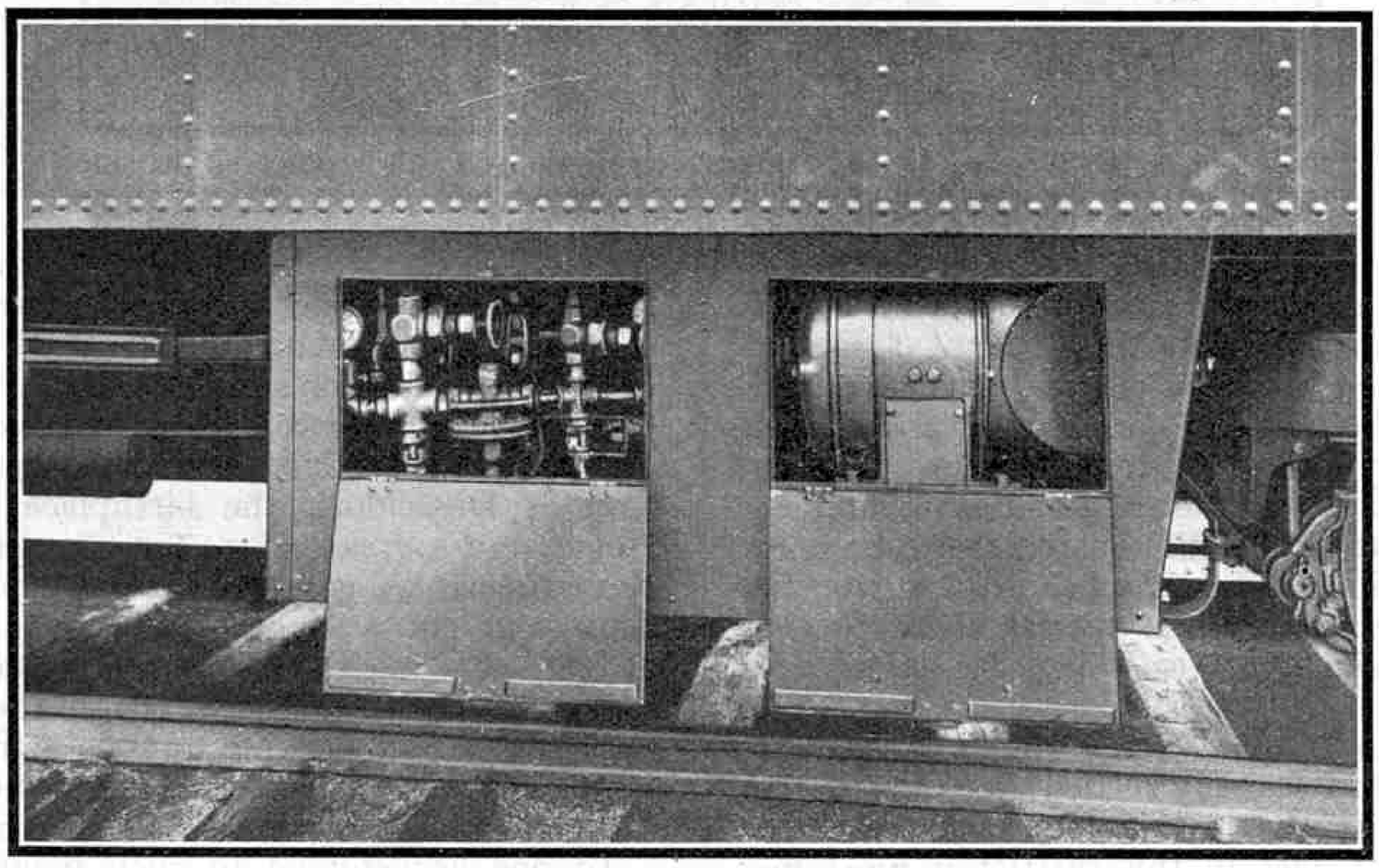


An underneath view of the car, showing the 10-kilowatt 110-volt generator and its driving shaft connected to one of the axles.

The temperature at which the conditioned air is distributed and delivered through the overhead louvres in the car is dependent upon the chilled water in the cooling coils. This, in turn, is automatically regulated to suit the conditions by a temperature control device which, through an arrangement of movable louvres, directs the re-circulated air in such a manner as to prevent too low a temperature in the car. This device is under the control of the steward, so that a comfortable temperature is maintained at all times.

Not only is the temperature of the air perfectly controlled, but the relative humidity also is controlled within certain limits depending upon outside atmospheric conditions and the temperature maintained inside the car.

Double-sash windows are fitted to the car and these are kept closed all the time. The doors also are closed except as required for the entrance and exit of passengers and the train staff.



A close-up photograph showing the casings (with inspection doors open) in which the refrigerating compressor plant is accommodated.

The electric requirements of the apparatus are in excess of the usual lighting system generator and therefore a special gear-driven 10 kilowatt generator has been provided to supply direct current at 110 volts. The critical speed of this generator, that is the speed below which no current is generated, is about 28 m.p.h.; and therefore provision is made for receiving power supply from a wayside connection when the train is standing at stations or in yards. It is intended to operate the air distributing fans and the cold water pump from the car lighting batteries, and the motors of these will shortly be changed from 110 volts to 32 volts, and the present 4 kilowatt belt-driven generator for the lighting system will be replaced by a 5 kilowatt gear-driven generator. Thus it will be possible for the cold water to circulate and the fans to be operated when the car is at a standstill, without the necessity for plugging in to a wayside connection.

When the speed of the train rises to the critical point, an automatic switch on the 110 volt generator closes and energy is then available for the motor-driven air-conditioning equipment. The various motors are automatically started through suitable control, and operate automatically until the speed of the train drops below the critical point, when the automatic switch opens. A regulator is provided on the generator so that the voltage remains constant irrespective of the amount by which the actual speed exceeds the critical speed. The control is so arranged that the compressor motor starts first, followed by the compressor auxiliary motors; that is the motor condenser pump and the cooling tower fan motor. If either of these compressor auxiliary motors should fail to start, or should stop after being started, the operation of the motor driving the compressor is automatically discontinued. As the generator does not operate below 28 m.p.h. it follows that the operation of the compressor and its auxiliaries is intermittent. The percentage of total schedule time during which the car is operating at below 35 m.p.h. varies from 16.4 to 22.5 per cent. During this time, however, comfortable temperatures can be maintained in the car, and the independent operation of the cold water pump and air distribution fans that will shortly be available will be a great aid in this direction.

Although this installation has operated in a satisfactory manner, further experiments are in progress in order to perfect it for general railway application. The question of power supply requires attention, and the weight of the air-conditioning equipment and the space necessary for it must be reduced, and also its cost. A further point is that in order to ensure certainty of operation and reasonable maintenance costs the system requires to be simplified to some extent. Whereas in Summer it is necessary to extract moisture from the air entering the car, it is desirable in Winter to be able to add moisture to it. The system appears to be based upon sound principles, however, and its improvement and development should follow as a matter of course.

It is interesting to note that the first bogie car in the United States was introduced by the Baltimore and Ohio Railroad in 1835.

Railway Notes on a Rhineland Journey

By Gerald W. Spink

RECENTLY I made the journey from Bonn on the Rhine to Newcastle-on-Tyne, and as the trains by which I travelled were all "crack" ones, the experience was extremely interesting. From Cologne as far as the Dutch frontier the train was a so-called "FD" train. German train terminology is interesting. Slow trains are called "Personenzüge"; semi-expresses are "Eilzüge"; while expresses are commonly known as "D-Züge" or "D" trains, the "D" being an abbreviation used for the word "durchfahrend," which means "going through." Some of the international trains receive the title "FD," the "F" meaning "fern," the German word for "far" or "distant." One or two very special trains, such as the "*Rheingold Express*," which travels daily between Holland and Switzerland by way of Germany, receive the distinctive title "FFD." There are also "L" or "Luxuszüge," corresponding to the French "trains de luxe." The quicker and more imposing the train the more one has to pay in Germany, as is the case also in France.

German station authorities are very considerate to their passengers. An indicator in the centre of the platform at the rather small station of Bonn points out where the different classes of coaches will stop when the train enters; this saves the traveller a great deal of enquiry and running about, and makes for punctuality in the despatch of trains. There is a further indicator for the purpose of announcing lateness of trains, but fortunately this did not require to be used on the present occasion. Bonn is a beautiful university and residential town, and has a special claim to the attention of all music lovers as being the birthplace of Beethoven.

After leaving Bonn I found many things to attract my attention, and I had scarcely settled down to strictly railway observation by the time Cologne was reached. The great network of lines in this district is most interesting, and so also are the many "burrowing" junctions, by means of which a train can pass under an adjoining set of metals without interfering with other traffic. I took the opportunity of our few minutes' stay in Cologne to inspect the engine and reckon up the tonnage of the train. The coaching stock was partly Dutch and partly German, and consisted of first-class and second-class cars in addition to a "Mitropa" diner, the whole weighing 287.5 metric tons or 283 English tons. Probably the gross tonnage of the train would be about 295 English tons, which is not a big load for a German locomotive. On account of their special character "FD" trains are usually restricted in weight, as the passengers travelling such great distances are naturally fewer as a rule than the passengers that use "D" trains. This particular train, which leaves Cologne at 5.48 p.m. and has the proud title "FD No. 263," is often hauled by a Prussian 4–6–0 of standard design, but recently it has been worked by one of the handsome "Pacific" locomotives built by the Bavarian firm of J. A. Maffei of Munich. These locomotives also work the Holland-Switzerland "*Rheingold Express*" over the German section of the line. We had "No. 18 527" of this type. It was interesting to note that its headlights were electric, although of course they were not yet required owing to the time of the day.

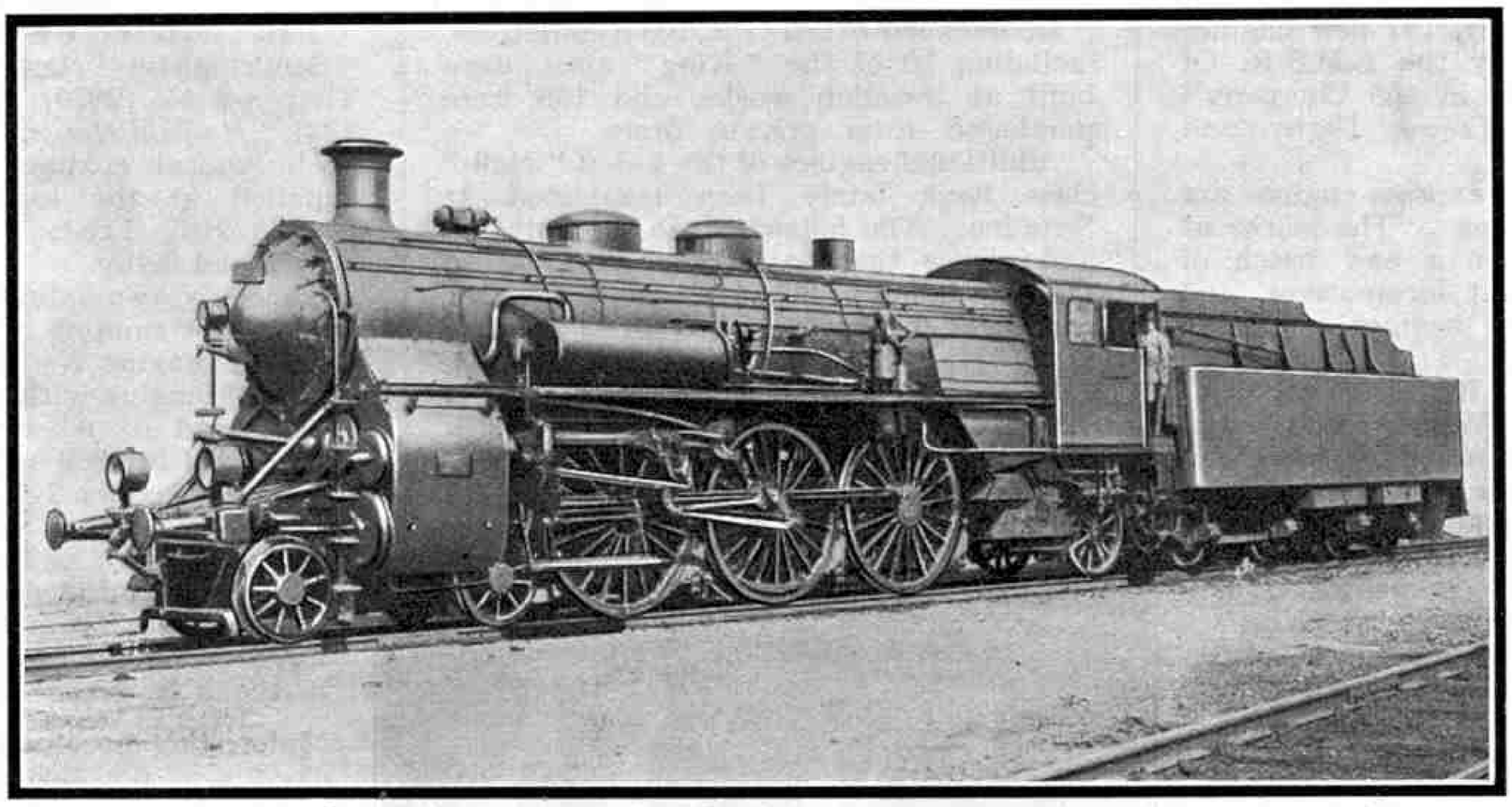
The "*Rheingold Express*" passing through Rhineland. It will be observed that the train travels on the right-hand track. This photograph and the one opposite are by W. Hubert, Verkehrszentralamt der Deutschen Studentenschaft, Darmstadt.

Schedule speeds through Rhineland are more leisurely than in England or over the Hamburg-Berlin line in Germany. Our big "Pacific," the graceful and somewhat long chimney of which makes its boiler appear smaller than it really is, had no difficulty at all in maintaining and even gaining time, in spite of a variety of slacks. Leaving Cologne punctually at 5.48, we had to crawl over the great Hohenzollern Bridge, and our approach to the first stop at Düsseldorf, the birthplace of the great poet Heine, and a great centre for art, was a very slow one. Nevertheless we gained a clear 1½ minutes on schedule time, and our average speed was 44.3 m.p.h. instead of the scheduled 42.5 m.p.h. Station distances in the German timetables are given to the nearest kilometre, so that it is not possible to time a train with quite the same accuracy as in England, where we know the distances to the nearest tenth of a mile.

To one accustomed to such magnificent scenery as is to be seen on, for instance, the main L.M.S. line between Leeds and Carlisle, the German countryside from Cologne northward seems flat and rather uninteresting. On the south-bound train from Bonn onward it is exceptionally beautiful, with views of the "Siebengebirge" or "Seven Mountains," including the austere "Drachenfels" or "Dragon Rock." But we have now left that far behind, and have been passing

through a district rich in pasture and relieved by woodlands, but as flat as the proverbial pancake except for a low range of hills between Bonn and Cologne, known as the "Vorgebirge." Signs of industry have not been lacking, and these increase as we enter the Ruhr district of Germany. On the next two stretches, Düsseldorf-Duisburg and Duisburg-Oberhausen, which are allowed 19 minutes and 10 minutes respectively, we continued to gain time slightly, and the 23 kilometres between Düsseldorf and Duisburg were run at an average of 46 m.p.h. This represents creditable locomotive work over a distance of some 14.3 miles, and compares very favourably with the 18-minute timing of many trains running start to stop over 14.1 miles between Northallerton and Darlington.

The most thrilling part of the journey undoubtedly occurred on the last stage of the "Pacific's" run between Oberhausen and Emmerich. For the distance of 61 kilometres 51 minutes are allowed, the overall average speed representing some 44.6 m.p.h. As far as Friedrichsfeld we were running at a good speed, but a severe slack occurred as we approached Wesel station, and for some distance we moved literally at walking pace. We did not actually stop, however, and by means of a good recovery later on our driver succeeded in reaching Emmerich in exactly 49 minutes 21 seconds, bringing our average speed up to 46.1 m.p.h. in spite of the slowing through Wesel. But for the slack the engine would not have had the slightest difficulty in performing the entire run in 45 minutes at an average speed of about 50.5 m.p.h. Between Dinslaken and Friedrichsfeld I estimated our speed to be 100 kilometres per hour for 10 kilometres, representing 62.1 m.p.h.



Bavarian type "Pacific" locomotive No. 18 454. The conical smoke-box door should be noted and also the electric headlights.

At Emmerich, a German customs station for trains entering Germany from Holland, our "Pacific" came off the train and a 4–6–0 Prussian locomotive hauled us in sparkling fashion over the short stretch between Emmerich and the frontier station at Zevenaar. Here, really particular people take the trouble to adjust their watches to Amsterdam time, which at Easter is 40 minutes behind Central European or German time, but is 20 minutes ahead during the summer. On embarking on the English boat at the Hook of Holland watches would again have to be altered to English summer time, which corresponds exactly with Central European time. English summer time was already in operation when I travelled, but Amsterdam summer time had not yet commenced.

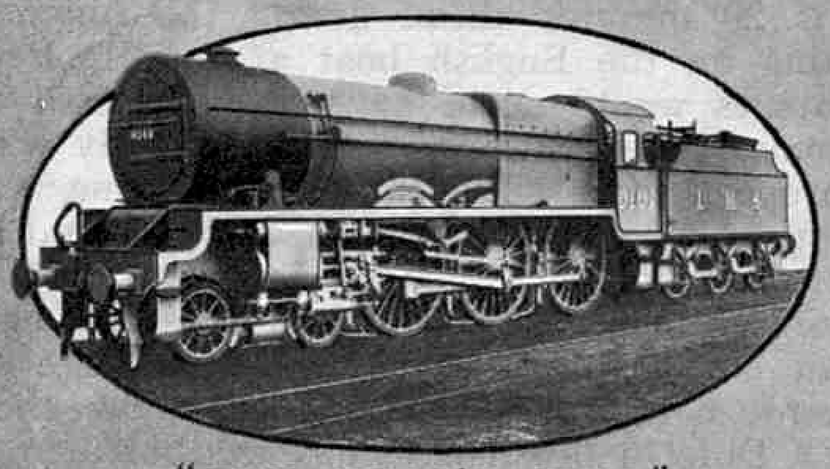
Examination of luggage and passports took some time at Zevenaar, although passengers going through to England were not troubled except to show their passports. A Dutch 4–6–0 took us forward, but the rest of the journey was less interesting owing to the approach of darkness. At Hook of Holland I had the pleasure of travelling in a comfortable berth in one of the three newly built steamers that ply between Harwich and Hook of Holland. These vessels, the "*Amsterdam*," "*Vienna*" and "*Prague*," represent the last word in cross-channel comfort by night.

Next morning I joined the 6.55 "*Hook Continental*" at Harwich, hauled by 4–6–0 No. 2803, "*Framlingham*," with a load of 403 tons. From London to York I travelled in the "*Flying Scotsman*" hauled by "Pacific" locomotive "*Gladiateur*" with 516 tons. We averaged exactly 69 m.p.h. on the "racing-ground" between Hitchin and Huntingdon, and reached York nearly 5 minutes ahead of time. I completed my journey to Newcastle a day or two later, joining the evening Hull-Newcastle express at York. On this occasion a North-eastern "Atlantic," No. 2163, three-cylinder "Z" class, brought my long journey from Germany to a splendid close by running from Durham into Newcastle in under 18 minutes instead of the 20 minutes allowed by schedule. This involved speeds of about 75 m.p.h. between Lamesley and Low Fell and an average of 67.4 m.p.h. over the seven miles from Chester-le-Street to Bensham. There speed was reduced to prepare for the approach to the magnificent King Edward Bridge that crosses the deep valley of the Tyne and brings us to Newcastle Central Station.

Lives of Famous Inventors—(*Continued from page 101*)

It has been argued that Le Prince's invention was the direct ancestor of the modern motion picture apparatus, because it had a multiple lens arrangement. It is true that Le Prince's American patent of 1866 was for a camera with 16 lenses, but there is no doubt that the actual machine he made in Leeds had only one lens. Further, his British patent of 1888 was for a "receiver" or camera, and "deliverer" or projector, using one lens as well as multiple lenses.

A memorial to Le Prince was unveiled at Leeds on 12th December last by the Lord Mayor of the city. The memorial is in the form of a tablet bearing a suitable inscription, erected on the wall of Le Prince's workshop at 160, Woodhouse Lane. The ceremony was attended by the inventor's daughter, Miss Marie Le Prince, who came from New York specially for the occasion; Viscount Exmouth, representing members of the Le Prince and Whitley families living in France and Burma, and by representatives of many scientific societies. A talking moving picture of the ceremony was taken by the Gaumont Co. Ltd., for inclusion in their "*Graphic*," and as a permanent record of the event. An interesting feature of the memorial arrangements was an exhibition of photographic, ceramic, enamel and other art work carried out by Le Prince and his wife at their School of Applied Arts. Great interest was shown also in the moving picture camera made by Le Prince in 1888, brought from America by Miss Le Prince for the exhibition.



RAILWAY NEWS

L.M.S.R. Locomotive News

During the past year, 187 new engines were commissioned by the L.M.S.R. Of these, 153 were built in the Company's own workshops at Crewe, Derby and Horwich.

At the moment no express engines are being built for this line. The works at Crewe are engaged on a new batch of standard 0–8–0 freight locomotives, and at Derby 2–6–2 tank engines are being turned out.

Engine No. 5630, "*W. M. Thackeray*," of the "Prince of Wales" class, and engine No. 5387, "*William Siemens*," of the "George the Fifth" class, have been altered to fit the Midland division gauge.

The "Royal Scot" locomotive No. 6161, which at first was named "*The King's Own*," has been renamed "*King's Own*," and with the renaming an interesting ceremony was associated. The King's Own Royal Regiment—after which the engine is named—having returned to England after an absence of 18 years, travelled on Wednesday, the 7th of January, from Southampton to Lichfield via Euston. At this famous London terminus a break in the journey was made in order to allow Brigadier-General F. B. Matthews, C.B., D.S.O., the Colonel of the Regiment, to perform the ceremony of renaming the engine and also to present placques of the crest of the Regiment.

When the special train arrived at Euston the officers and men formed up on No. 6 platform. As General Matthews unveiled the placques, which had previously been fixed to the engine, the Regimental Band played the March of the Regiment. Later the train left for Lichfield drawn by the engine "*King's Own.*"

Progress of S.R. Electrification Scheme

Good progress has been made with the electrification of the Southern Railway line between London and Brighton. In addition to the 14 miles of main line (from London to Purley) already electrified, 31½ miles of conductor rail have been laid; 28 miles of conductor rail have been bonded (i.e., joined up at the ends with copper wires to give the electrical connection), and 50½ miles of track rail bonded to serve as the return rail.

In the sub-stations at Victoria, Forest Hill, Streatham, and Purley, foundations have been laid for additional machines, and another big job which has had to be put in hand as the outcome of this electrification is the drainage of Balcombe Tunnel. With electric trains and the consequent danger of short-circuiting, the risk of flooding must be reduced to the absolute minimum.

G.W.R. Locomotive Building Programme

In the course of last year, 105 locomotives, including 10 of the "King" class, were built at Swindon works, and 138 were purchased from private firms.

Additional engines of the 4–6–0 "Hall" class have lately been completed at Swindon. The following are the numbers and names that have been allocated to the new batch of 20 which are now either completed or building:—4981, "*Abberley Hall*"; 4982, "*Acton Hall*"; 4983, "*Albert Hall*"; 4984, "*Albrighton Hall*"; 4985, "*Allersley Hall*"; 4986, "*Aston Hall*"; 4987, "*Brockley Hall*"; 4988, "*Bulwell Hall*"; 4989, "*Cherwell Hall*"; 4990, "*Clifton Hall*"; 4991, "*Cobham Hall*"; 4992, "*Crosby Hall*"; 4993, "*Dalton Hall*"; 4994, "*Downton Hall*"; 4995, "*Easton Hall*"; 4996, "*Eden Hall*"; 4997, "*Elton Hall*"; 4998, "*Eyton Hall*"; 4999, "*Gopsal Hall*"; 5900, "*Hinderton Hall.*"

Swans presented by the Dyers' Company (one of the City of London Guilds) to the South African Corporation, arriving at Kingston en route to Bloemfontein. Our photograph is by courtesy of the "Southern Railway Magazine."

During the present year 130 locomotives are to be built at Swindon. Of these, 50 will be of the "517" 0–4–2 tank class; 30 of the "51" 2–6–2 tank class; 30 of the "43" 2–6–0 mixed-traffic class; and a further 20 of the "Hall" class. For these latter the names chosen are:—"*Hazel Hall*"; "*Howick Hall*"; "*Keele Hall*"; "*Kelham Hall*"; "*Knowsley Hall*"; "*Lawton Hall*"; "*Marble Hall*"; "*Moreton Hall*"; "*Newton Hall*"; "*Park Hall*"; "*Preston Hall*"; "*Queens Hall*"; "*Rushton Hall*"; "*Ripon Hall*"; "*Trentham Hall*"; "*Trinity Hall*"; "*Westminster Hall*"; "*Walton Hall*"; "*Worsley Hall*"; "*Wycliffe Hall.*"

A L.N.E.R. Veteran Locomotive

Two further 4–6–0 engines of the "Sandringham" class are now in service. They are No. 2820, "*Clumber*" and No. 2821, "*Hatfield House.*"

Mechanical coaling plants are to be installed at the locomotive depots at Neville Hill, Leeds; Botanic Gardens, Hull; and Selby.

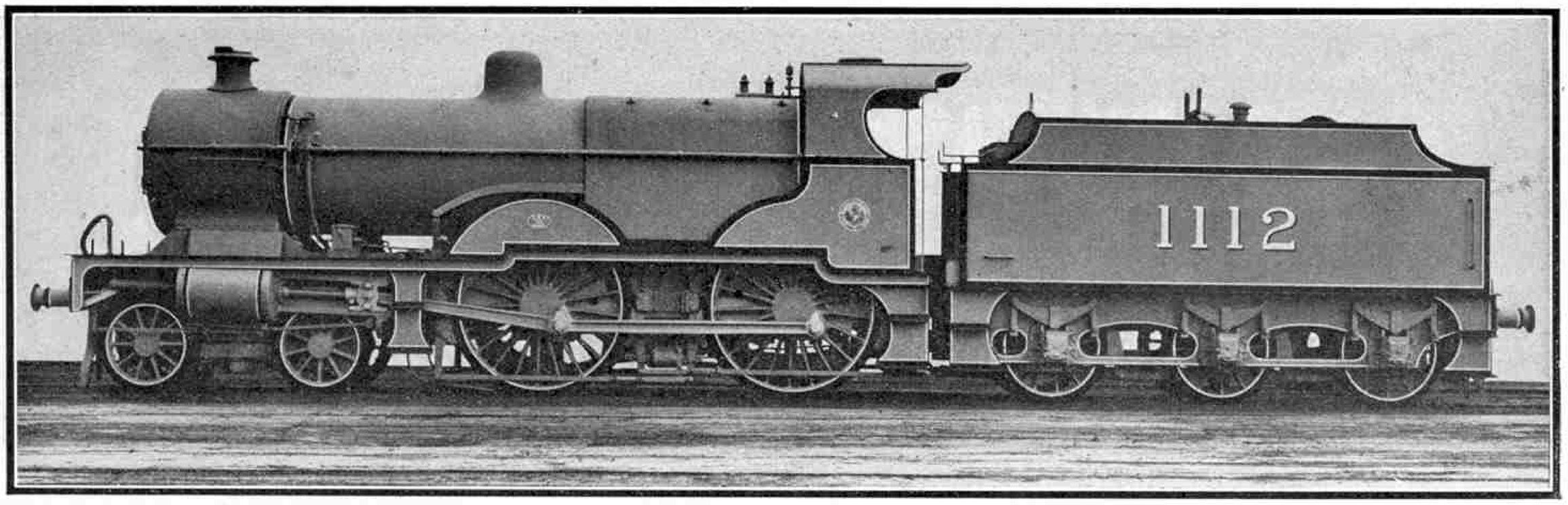
The only two-cylinder compound locomotive now running in this country is the L.N.E.R. engine No. 66, "*Aerolite.*" It is a tank engine with one pair of driving wheels, and its wheel formula is 2–2–4. It was built in 1869 and it is believed that parts of an earlier 2–2–2 well-tank engine of the same name were utilised in its construction. The locomotive has undergone considerable alterations from time to time. It is now used principally for drawing the special officials' saloon in the N.E. area.

Interesting Locomotives at Shrewsbury

During the Christmas holidays a number of interesting locomotives were noted in a short stay of 15 minutes at Shrewsbury (L.M.S. & G.W. Joint Rlys.). These included Great Western 4–4–0 No. 3717, "*City of Truro*" (which in 1904 achieved the world's record speed of 102.3 m.p.h.) acting as station pilot; L.M.S. Midland Compound 1133 (Longsight Shed), piloting G.W.R. 4–6–0 2939, "*Croome Court*" on a local train; Lancashire & Yorkshire superheated 0–6–0 No. 12619 working in from Central Wales line; and 2–6–4 tank loco 2354 on Crewe semi-fast train. Other Great Western locomotives standing in the station were 2–6–0 "Mogul" No. 6303, and 2–4–0 Tank No. 1401. The little tank engine is a real veteran, but still works fastly-timed local trains. Engines of this class are known as "Metropolitan" tanks, and many now work auto-trains.

"Mikado" Locomotives for Belgian Railways

The latest type of express engine built for the Belgian National Railways marks a striking departure from previous practice. It is of the 2–8–2 "Mikado" type, and has bar frames and other features that closely accord with American standards. The coupled wheels are of 5 ft. 6 15/16 in. diameter, which is small for express work. There are two outside cylinders having a diameter and stroke alike of 28⅜ in. The ample boiler has a total heating-surface (including that of the superheater) of 4,271 sq. ft. The grate area is 59.2 sq. ft. The weight of the engine in working order is 131 metric tons, of which 92 are on the driving wheels. The 8-wheel bogie tender carries 8,130 gallons of water and 10 tons of coal, and weighs 82 tons.



Express locomotive No. 1112, one of the 235 " Standard Compounds " now owned by the L.M.S.R.

Pullman Cars for S.R. Ocean Specials

Luxurious Pullman parlour cars are now provided for Atlantic passengers on the Southern Railway Special Ocean Liner Expresses between Waterloo and Southampton.

Special vehicles have been built for this new de luxe service and embody many improvements, the principal being that the shells are built entirely of steel with the underframe constructed to form an integral part of the body. The length of the cars over the vestibules is 65 ft. 4 in.; the height from rail to roof is 12 ft. 5 in.; and the width over mouldings is 8 ft. 7 in. The floors are of dovetail corrugated steel on which is laid a fireproof material that is covered with rubber and carpets, forming a rigid and sound-deadening floor.

Externally the cars are of handsome appearance, being finished in the Pullman standard colours, amber and cream, relieved with gold lines and scroll decoration.

The new service was used first on Saturday, 3rd January, when passengers arriving at Southampton by the White Star Liner *"Olympic"* and the United States Liner *"Leviathan"* were conveyed to London. To mark the occasion special souvenirs were given to the passengers.

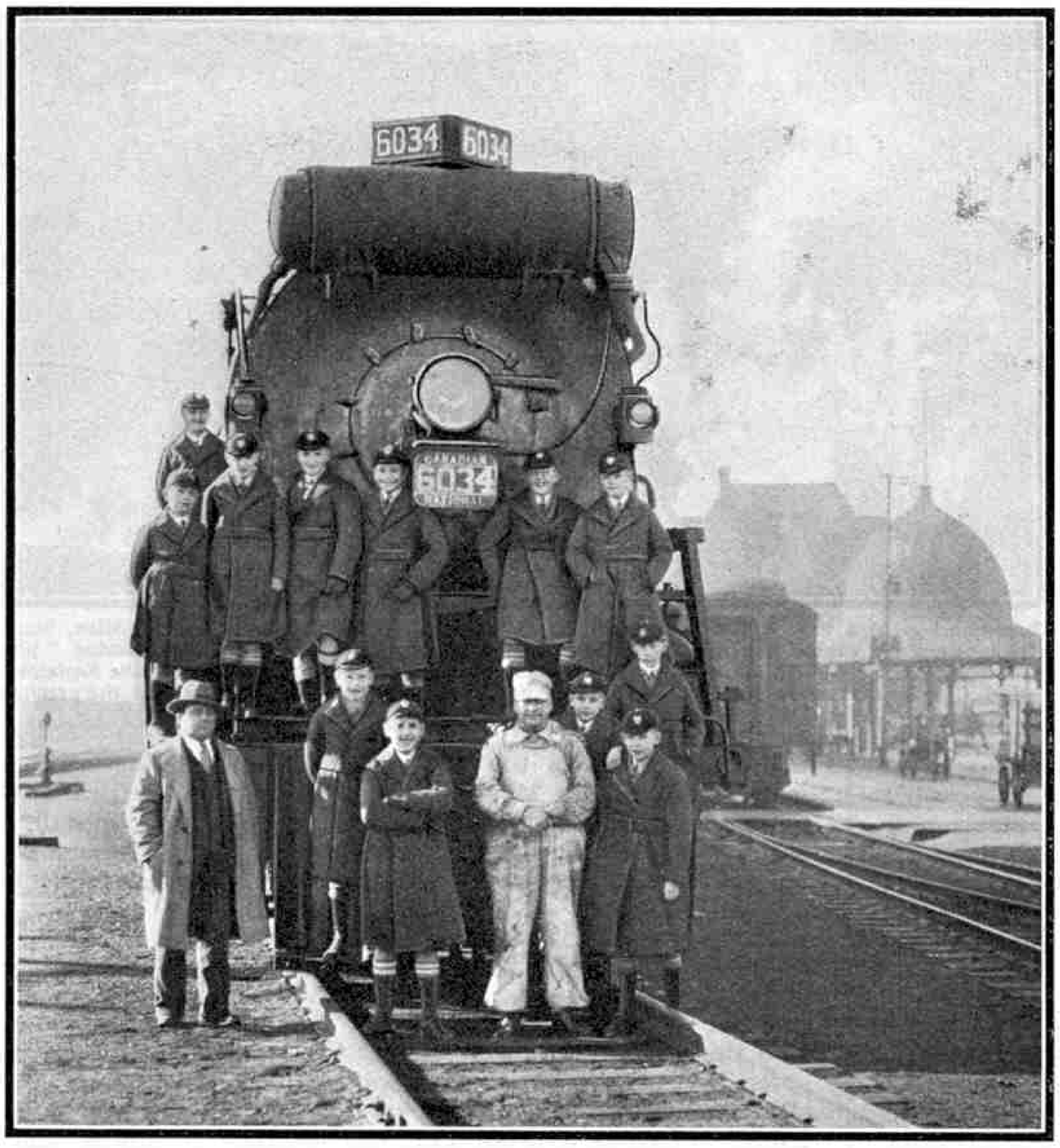
Shower Baths on a Train

The first hot and cold shower bath to be installed on a railway train in this country has been fitted experimentally in a first class sleeping car of the 10.35 p.m. King's Cross to Edinburgh and 10.50 p.m. Edinburgh to King's Cross night expresses.

The compartment measures 4′ 6″ by 6′ 5″ and includes a bathing cabinet 2′ 1″ square. Water from a 75-gallon tank suspended beneath the carriage is pumped at a constant pressure through six side sprays and a head douche in the bath cabinet. Hot or cold baths may be taken, the temperature being adjusted by means of a hand controlled valve.

Brilliant Colours for C.N.R. Locomotives

Interesting experiments on the visibility of various colours at great distances have been made by the engineers of the Canadian National Railways, who have found that red and yellow may be seen more easily under these conditions. All self-propelling cars used in place of steam locomotives on the branch lines of the railway are therefore being painted bright red and yellow in order to enable them to be seen readily when approaching level crossings. At these good use is already made of bells and horns in order to give warning of the approach of trains, and it is hoped that the adoption of brilliant colours will reduce the number of collisions that take place.



Choir boys of His Majesty's Chapel Savoy, London, make friends with the driver of a Canadian National Railways " 6000 " type locomotive during a concert tour in Canada. The chimney of the engine is hidden by the prominent feed water heater and number frames. Photograph by courtesy of the C.N.R.

Railway Plans for 1931

In spite of the depression in trade, the British Railway Companies are pursuing a progressive policy and planning extensive developments for the present year. The schemes which are to be put in hand will cost about £30,000,000 and provide employment for many thousands.

On the G.W.R. 400 miles of track are to be relaid; many stations are to be rebuilt; the Carnon viaduct on the Falmouth branch is to be reconstructed; and several of the Company's docks are to be modernised. Many new road vehicles are to be purchased and much additional garage accommodation provided. No less than £1,199,000 is to be spent on new locomotives and rolling stock.

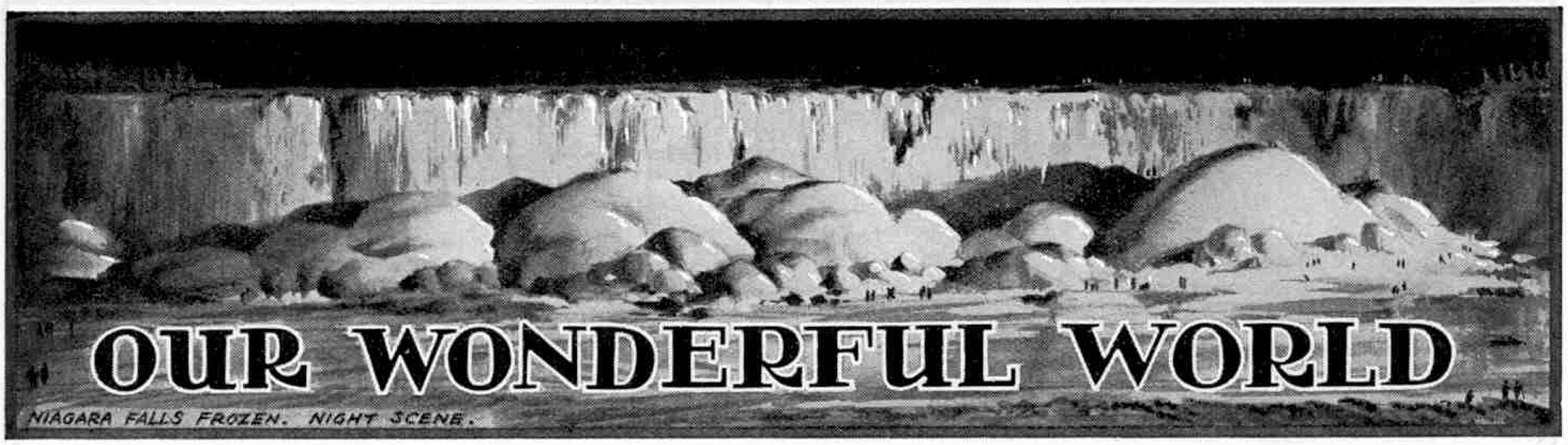
The L.M.S.R. programme includes 155 new locomotives, 700 passenger coaches and 80 motor vehicles. Tracks are to be widened in several places.

On the L.N.E.R. also considerable track widening is to be done in order to speed up traffic, and improvements are to be made at Hull and Grimsby docks and at Parkeston Quay.

During 1931, the Southern Railway intends to complete the first section—to Three Bridges—of the electrification of the main line from London to Brighton and Worthing, and also to press forward the great £13,000,000 dock scheme at Southampton.

The Inventor of the Railway Ticket

A handsome brass tablet " in honoured memory of Thomas Edmondson, a Lancaster man who in the early days of railways devised the railway ticket system and invented machines for printing, numbering and dating tickets," has been erected at Lancaster (Castle) Station by the " Old Lancastrians " Association. Before Edmondson's invention was brought into use, tickets were written out by hand. The new system was first used on the Manchester and Leeds Railway.



An Australian Lake Without Water

Among the many mysterious and curious features of the great Australian Continent is Lake Eyre, an expanse in South Australia having a surface area of some 4,000 sq. miles. The lake has obtained for itself a remarkable reputation. Cattlemen have described it as a bottomless swamp that has swallowed up many thousands of cattle; a recent visitor has declared that he drove for miles in a heavily loaded motor lorry over the surface of the lake! These statements sound hopelessly contradictory, but the explanation is that Lake Eyre resembles other lakes in practically all respects but one—it usually contains no water!

It is believed that 50,000 years ago the lake was full of water and was fed by immense rivers; in the intervening period Central Australia has become a desert, the rivers are now small, and the lake is practically dried up. On the rare occasions when it does contain water evaporation from its surface reduces the level by more than an inch a day. In place of water there is now a white crystalline deposit of millions of tons of salt that gives an arctic appearance to the neighbourhood. The deposit has been accumulating for ages, and it is possible that it contains valuable potash and magnesium salts.

It is an interesting fact that the explorer who made the most recent survey of Lake Eyre discovered small lizards and colonies of ants many miles from the shore.

Visiting Card Carried by Six Men

In China the size of a visiting card is proportional to the esteem in which the person visited is held. There is on record an instance of an English Ambassador of the 17th century having on one occasion received a visiting card 18 ft. in length, and carried by six men!

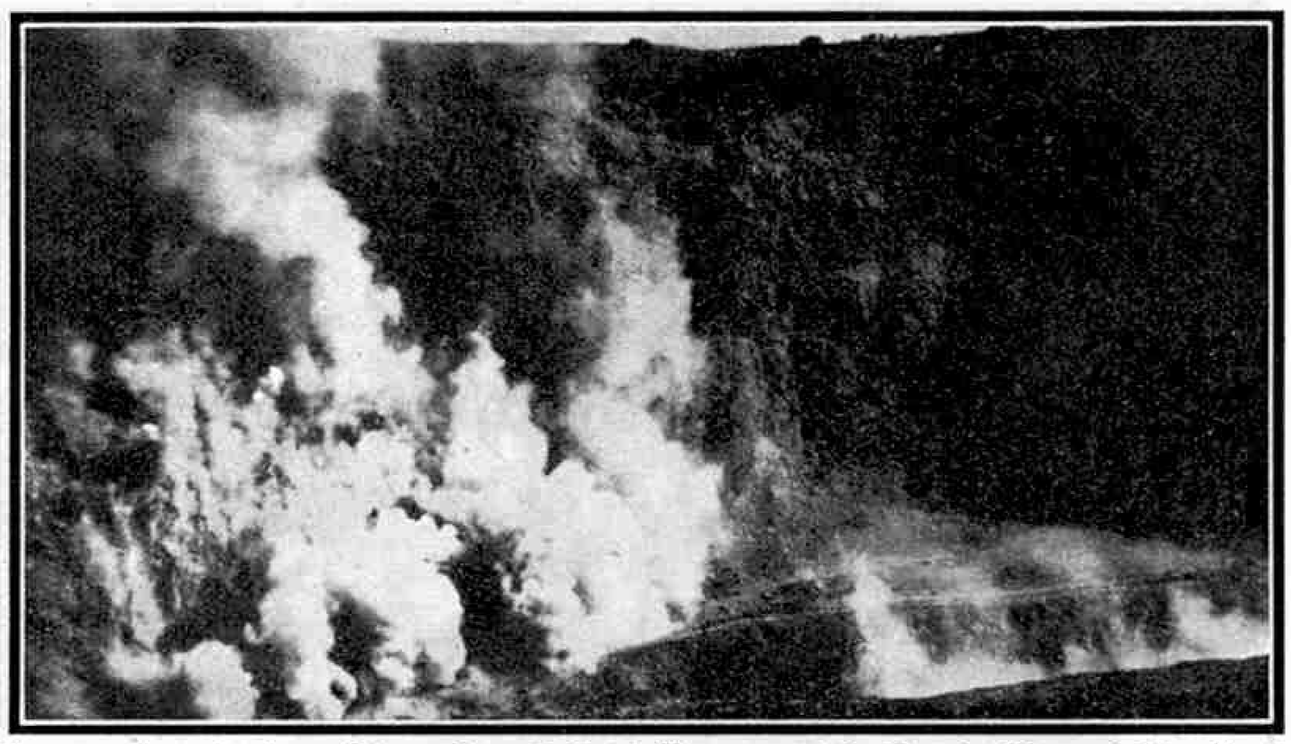
The visiting card originated in China. It has been in use there for twelve centuries, and is an elaborate placard rather than a card, for on it are designs intended to convey the sender's good wishes and compliments. In Europe the visiting card made its appearance during the 17th century, but it was not until about 85 years ago that it took the small and simple form in which it is used to-day.

A Speed Record in the Heavens

A nebula, known to astronomers as N.G.C. 7619, is credited with the speed record of the heavens. This object travels at the astounding rate of nearly 2,400 miles per second, the previous highest speed recorded for a celestial body being only a little over 1,000 miles per second.

The nebula is at an enormous distance from the earth, and can be observed successfully only by means of giant telescopes, such as the 100-in. reflecting instrument at the Mount Wilson Observatory, California. The measure of its speed was obtained by photographing its spectrum, and so faint is its light that one of the plates on which the spectrum was recorded had to be exposed for 45 hours! This meant several nights' work at the Observatory.

These photographic records showed that the spectral lines were similar to those given by the Sun, but that all were moved slightly towards the red end of the spectrum. This is a proof that the nebula is moving away from the Earth, and the extent of the shift shows that in every second it increases its distance from us by almost 2,400 miles. Even this may not represent the limit, and other faint nebulae that are now being examined may be found to have even greater speeds. Certain of these are more than 100 million light-years distant and only the wonderful range and delicacy of the telescope and spectroscope, the astronomer's two allies, have enabled us to learn anything of them.



Three-quarters of a ton of dynamite exploding! The scene at the Premier Diamond Mine, South Africa, when the explosive in 300 blast holes is detonated. Twice daily diamond-bearing "blue ground" is torn loose by the explosive. As explained in the article on page 703 of the September "M.M.," it is afterwards crushed, washed and passed over grease tables in order that the precious stones may be extracted.

Is The Gulf Stream Moving Westward?

For the past 40 years Sir Arthur Rostron, commander of the "*Berengaria*," has made a careful study of the course of the Gulf Stream, and has come to the conclusion that it is moving slowly westward. The famous current is readily detected, for the waters composing it are warmer than those of the rest of the Atlantic Ocean; and on a recent trip from Southampton to New York Sir Arthur found that actually it was sweeping the coast of North America, although its normal course is more north-easterly.

If the current really moves west in the manner suggested by these observations, it will bring about enormous changes. The climate of New York and the New England States, and perhaps of Nova Scotia, will change considerably. There is even a possibility that this portion of the American continent may become sub-tropical in character, so that palms may grow as freely as they do at present in Florida and other States in the south. America's gain in this respect might easily become our loss. At present the influence of the Gulf Stream is felt in this country, and even as far north as the Norwegian coast. If the stream moves westward the average temperature here must fall, and we may return to the old-fashioned type of winter during which deep snow lies on the ground.

World's Fastest Insect

When aeroplanes are able to travel through the air as fast as the speediest insect known, a journey round the world will take little more than a day, and in summer it will be possible to fly from Great Britain to New Zealand between sunrise and sunset. Very little is known about the wonderful insect that is capable of doing this, for its speed is 850 miles per hour, and it is so tiny that it is difficult to obtain specimens. When passing it can only be seen as a blur.

Aeroplanes that are speedier than any known birds already have been constructed and there seems to be hope that eventually machines capable of keeping pace with this insect may be designed. M. Louis Blériot, the pioneer aviator, is already looking forward to the time when speed of this order will be attained.

Is Mars Inhabited ?

Ever since the discovery on Mars of the markings that have been described as "canals," the question of whether life of any kind exists on the planet has been seriously argued. Dark and light areas may be distinguished on the surface of Mars. The former are greenish or bluish in colour and are usually believed to be covered with vegetation of some kind; while the light-coloured areas are regarded as deserts. It has been discovered that oxygen is present in the Martian atmosphere, and this strongly suggests the presence of vegetation on the planet; for so far as is known the only manner in which a planet can obtain a supply of this gas in a free state is through the life activity of plants.

It has been suggested that the famous canals of Mars are proof of the existence on the planet of intelligent beings, capable of planning and carrying out vast irrigation schemes to conduct water in summer from the melting Polar ice caps to the tropical regions around the equator. It is now thought that these "canals" may be the wide and shallow valleys of rivers, and probably Martians exist only in the imagination of sensational writers. If this is the case, then there are no grounds on which to base a belief in the presence on our neighbour of beings with the intelligence and resource of the inhabitants of the Earth.

The only living creatures that a visitor to Mars would be likely to see are animals in the invertebrate stage; in other words, the planet may be inhabited by creatures of the scorpion and crayfish types! This suggestion is based upon the fact that on Mars there are no mountains. Without mountains there can be no waterfalls of any magnitude, and it has been pointed out that it was in struggling up waterfalls that invertebrate animals on Earth developed backbones and slowly changed into the vertebrate animals that continued to develop until they became predominant.

Warm-blooded animals are almost certainly lacking on Mars, for there the difference between the night and the day temperatures is too great for them. It has been suggested that the only warm-blooded animal that could live under Martian conditions is the beaver, for it has a fur coat to protect it from the cold of the Martian night, and is equally at home on land or in water. If beaver-like creatures are found on the planet their bodies must be larger and their lungs more extensive than those of Earthly beavers, for the proportion of oxygen in the atmosphere is much smaller than in that in which we live. In addition, sunlight on Mars is much more feeble than on Earth, and for this reason Martian beavers probably would have much larger eyes.

Tin from Cornish Sand

In Cornwall tin has been extracted from the earth for thousands of years, and it was probably the discovery of the metal in this region that led to the earliest appearance in history of the British Isles. To the Phoenician sailors who found their way northward through the Straits of Gibraltar and along the shores of Spain and France, these islands were known as the Cassiterides or Tin Islands. The deposits of ore were very thoroughly worked in those early days, but the most valuable of them all, that of St. Austell, remained untouched, for it was hidden by a thick layer of china clay.

Many million pounds worth of tin have been extracted in Cornwall, and

The Premier Diamond Mine by night. Powerful flood lights illuminate the bottom of the mine, where the "blue ground" is being extracted.

attention is now being given to the sands carried down by the rivers that flow through the mining regions. The presence of the metal is particularly noticeable in the sand in St. Ives Bay, and after a north-westerly storm the waves pile this up in such enormous quantities that the beach appears quite black. It is now proposed to lay down a plant for extracting the tin. In some places the sand contains as much as 10 per cent. of it, and it is estimated that 40,000 tons may be recovered.

On rocks in the bay a giant funnel of ferro-concrete is to be built, communicating with a point on shore by means of a tunnel nearly half-a-mile in length. The tin-bearing sand will be sucked up by dredgers capable of dealing with 500 tons of sand and 5,000 tons of water per hour. It will be deposited in the funnel, and after flowing down tubes in the tunnel will be pumped to a concentrating mill. The material that emerges from the mill will contain about 25 per cent. of tin, and will be ready for the smelter. Formerly it did not pay to treat such weak concentrates as this, and smelters refused to buy them unless from 50 to 75 per cent. of the metal was present. Improvements in the smelting processes have been made, however, and now the St. Ives sand can be treated successfully at a cost that keeps the price of the tin produced at an economical level.

Throughout the ages tin has maintained its position as one of the most important of the metals, and to-day it finds employment in so many industries that it may almost be described as one of the key metals of modern civilisation.

The Home of the Locust Discovered

From very early times the locust has been so destructive that its name has become a symbol for desolation, and the insect is still a great menace. For many centuries hordes of locusts have spread devastation throughout northern Africa, Egypt and eastern countries, but it is only recently that the origin of these pests has been discovered, providing a possibility of solving the problem of dealing with them.

One of the chief breeding places of the locust is the fertile region around Lake Tchad, a stretch of water south of the Sahara that is bordered by British Nigeria and French African territory. The insects do not leave their home unless compelled, and this fact accounts for the irregular nature of their migrations. They only set out to visit other lands when they become so numerous that there is not sufficient food for them, and when at the same time the heat becomes too great. Then millions of them cross the desert to Morocco, Algiers or Egypt. As a rule they do not extend beyond these countries, but a recent swarm crossed the Red Sea and created havoc in Arabia, and even as far east as Persia. Recently also the insects have threatened to cross the Straits of Gibraltar, and their entry into Spain would be a serious disaster.

In past times the natives built mud walls to divert the locusts, or spread paper in the fields to attract them, and beat them to death when they settled on it. Whenever a visitation occurred, locusts by the sackful were collected by the natives and burnt. More effective and scientific means of dealing with the creatures have been used in recent years. Aeroplanes have broken up the formations and killed millions of the insects. Poison gas and flame throwers also have been used, and during the last migration the swarms were so greatly reduced that probably it will be six or seven years before increasing numbers cause another exodus from the region round Lake Tchad. In the meantime plans are being considered for attacking the insect in its own home. This might be done by destroying the young insects by gas or fire, or perhaps by flooding; and an additional means that has been suggested is the artificial feeding of the insects in order to prevent their departure for other lands.

Electrons by the Million !

When an electric lamp is switched on millions of electrons pass through its filaments in every second. It has been estimated that the number passing in this time through a wire in which a current of one ampere is flowing is eight million million million! If spread out evenly in such a manner that each electron is allotted the space of one square inch, these would almost cover North America.

XVI.—AN ACCOUNTANT

THE profession with which we are to deal this month is quite different in type from those previously considered in this series, for instead of being based on engineering or science, t is concerned with business from the financial side. It is one of gr owing importance, for every year manufacturers, and business men generally, realise more and more the value of the information that a trained accountant can supply from close examination of their books. The analysis of costs of products at every stage of their progress through the works in which they are made is of the greatest value in ensuring that a business is being run on sound lines, and in recent years an increased demand has arisen for costs accountants, as the men who carry out responsible work of this kind are called. But the scope of accountancy is far wider than this. To-day there are very few concerns, large or small, in which a trained accountant, who is a member of a professional association of high standing, is not called in to audit accounts, deal with such matters as Income Tax returns, and generally to advise on all financial points. In the present article we are chiefly concerned with careers in the accountancy profession.

Anyone who is skilled in book-keeping, and is able to keep accounts accurately, may describe himself as an accountant, but those who wish to become accountants in the full sense of the word must qualify for membership of one of the institutions into which the profession has been organised. The principal associations of this kind are the Institute of Chartered Accountants in England and Wales, which was founded in 1880; and the Society of Incorporated Accountants and Auditors, formed five years later. Both societies derive an official standing from their method of incorporation. They admit to membership only those candidates who prove themselves to have a thorough knowledge of accountancy from every point of view, and thus number in their ranks only men who are competent to carry out the many duties they are called upon to perform. In addition they have rules and regulations governing the conduct of members. The object of these is to uphold the reputation that members of both societies have attained, and they are strictly enforced in order to help to maintain public confidence.

Ordinary members of the Chartered Institute may be distinguished by the letters "A.C.A." that appear after their names, while Fellows make use of the initials "F.C.A." Those who have secured admission to the Society of Incorporated Accountants and Auditors are known as "Incorporated Accountants," and members and fellows make use of the initials "A.S.A.A." and "F.S.A.A." respectively. The two bodies are practically equivalent in status, and the requirements from candidates for admission to them are equally exacting in character.

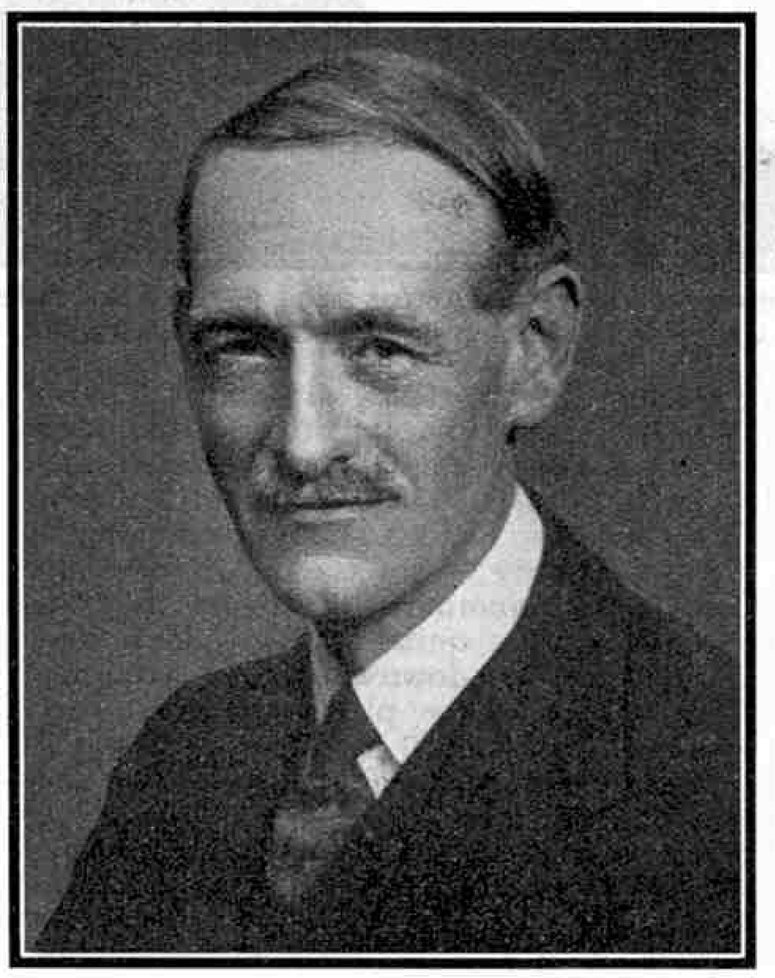
In addition to the two associations already referred to, there are others that have been established in comparatively recent years. The qualifications demanded from those seeking entry into these bodies are not so high as in the case of the old-established societies, and the younger organisations are not nearly so powerful or influential. In certain instances they have been founded chiefly to meet the requirements of those engaged in accountancy work in large manufacturing concerns, and their members do not necessarily engage in public accountancy.

A boy whose interest is in figures and who has the desire to become an accountant, should keep his intended profession in view during the latter part of his school career. Special attention should be given to mathematics, of course, but other subjects should not be neglected. A sound general education is always an asset, and in the preliminary examinations of the two chief professional bodies, English, history and other general subjects are included, one of which must be a language. The passing of this preliminary examination is the official opening of an accountancy career, but in the principal professional bodies exemption is granted to boys who have passed the Matriculation examination of a University, or are in possession of a School Certificate with a sufficient number of credits. Full details of the various examinations that are accepted as equivalent to their preliminary examinations may be obtained by writing to the Secretaries of the Institute of Chartered Accountants, and the Society of Incorporated Accountants and Auditors. The address of the former is Moorgate Place, London, E.C.2, and of the latter, Victoria Embankment, London, W.C.2.

When the necessary preliminary education has been completed the next step is to become articled to a practising accountant. This may be effected through a personal introduction, or possibly a satisfactory arrangement may be completed with a friend who is a member of the profession. If a boy cannot secure a position as an articled pupil by either of these methods, he may approach accountants practising in his neighbourhood. This plan may not be successful immediately, and it may be necessary to wait some time before a vacancy occurs. Alternatively a suitable opening may be found by studying the advertisement columns of professional publications such as "*The Accountant*," or "*The Incorporated Accountants' Journal*"; or of daily journals such as "*The Times*," the "*Daily Telegraph*," and the "*Morning Post*."

The two chief bodies require that an articled pupil shall have reached the age of 16 years, and shall serve for a period of five

A PROMINENT ACCOUNTANT



Mr. Henry Morgan, F.S.A.A., is President of the Society of Incorporated Accountants and Auditors. He had a distinguished career as a student, securing third place in the intermediate and final examinations of the Society. Later he commenced practice on his own account, and is now senior partner in the firm of Morgan Brothers & Co.

Mr. Morgan was elected a member of the Council of the Society in 1919, and occupied the position as Vice-President from 1926 until his election as President. He is a member of the Board of Referees on Inland Revenue matters, and is honorary auditor of the London Chamber of Commerce. He is also a director of many leading companies, including two interested in the manufacture of aero engines.

years; the only exception to this rule being that University graduates are allowed to sit for the final qualifying examination after serving for only three years. A premium is usually required. This may vary from 100 guineas to 300 guineas, and in certain instances even more may be asked. In large firms of very high standing sums as high as £500 must be paid, but there are many accountants who will take pupils for a premium of about 100 guineas. In many cases part or all of this is returned in the form of a small weekly wage.

A point of importance that must be considered very carefully when choosing a firm with which to serve articles, is that the experience gained during this period depends largely on the size of the firm and on the character of the work that it carries out. If it is a very small office, the newly articled clerk will come into immediate contact with the principal, but the advantages this will give may be neutralised by the restricted scope of the work. On the other hand, in a very large office work may be too departmentalised; and generally speaking the best training may be obtained in an office of intermediate size, in which work of an all-round character is carried on.

It is possible to become a member of the Society of Incorporated Accountants and Auditors without serving articles, but this plan has the disadvantage that it involves a considerable delay. The regulations provide that a clerk who has not been articled may apply for permission to sit for the intermediate examination on reaching the age of 22 years, if he has served for a continuous period of six years in a public accountant's office. Similarly a clerk who has been in accountancy work under a qualified man for a period of nine years, and is at least 25 years of age, is eligible to sit for the final examination. On the other hand, articled clerks usually take the final examination at the end of their term of service, which means that they may become members of the Incorporated Society, and qualify to act as accountants, at the age of 21. It may be added that the Institute of Chartered Accountants insists that every member must have been articled to one of their own body.

Articled clerks who are endeavouring to qualify themselves for membership of the Society of Incorporated Accountants are required to become members of one of the students' societies, or students' sections of district societies associated with that body. This plan brings with it great advantages, for lectures in professional subjects are given at the meetings of the society and discussions are organised among the students. Similar societies exist in connection with the Chartered Institute, and students qualifying for membership of this should make a point of associating themselves with the society organised in their own district.

When an articled clerk has served half the standard period he may sit for the intermediate examination of the professional association or the society of which he wishes to become a member. The two examinations cover similar ground. They are professional in character, and if the future accountant passes he will probably be given more interesting and responsible work than that previously carried out. This will give him better opportunities of studying advanced accountancy practice, particularly if he is sent out on audit work. He should take full advantage of these chances, for knowledge gained in this manner will be of value in his preparation for the final examination, and also when he himself becomes a practising accountant.

The final examination also is professional in character, and covers practically the entire field of accountancy and auditing, including the legal knowledge that every accountant must have. In order to pass creditably it will be necessary to study the principles of the profession, and of the law relating to it, very thoroughly. The seniors of the firm with which he is connected usually may be relied upon for guidance and assistance, but attendance at courses specially arranged for the purpose is advisable during the period of preparation.

THE BOY SCOUTS ASSOCIATION,
25, BUCKINGHAM PALACE ROAD,
LONDON, S. W. 1.

11th November 1930

Dear Sir,

Many thanks for the copy of the "Meccano Magazine".

With your widespread influence on youth you have an unrivalled opportunity of giving sound advice to boys as to shaping their futures. I am therefore so glad to see that you are doing this and cordially wish you a full measure of success.

Yours truly,

Baden Powell.

After passing the final examination, completing the term of articles, and attaining the age of 21, the student is eligible for election to associate membership of the professional body he wishes to enter. He is then allowed to make use of the qualification "A.C.A." or "A.S.A.A.," and is in a position to act as a public accountant, on his own behalf, or in partnership, or as a qualified clerk in the employ of another accountant. After having been in continuous professional practice as a public accountant for five years, a chartered accountant may become a Fellow of his Institute (F.C.A.), and after three years spent in a similar manner an Incorporated Accountant may be admitted to Fellowship, and is then entitled to make use of the initials "F.S.A.A."

The cost of obtaining associate membership of the two professional bodies varies considerably. The necessary examination and membership fees in the case of the Chartered Institute is 15 guineas, while in the case of the Society of Incorporated Accountants and Auditors these amount to 17 guineas. In both cases the payments are spread over a number of years, and they do not include the cost of books and of any course of tuition that may be thought necessary. When premiums also are added to these sums, it will be seen that the cost of becoming an accountant is fairly high; and of course there is no prospect of earning anything beyond pocket money until qualification has been secured. It must be remembered also that the purchase of a partnership in an existing firm of accountants may be costly, and the returns from a new office cannot be very great until it has become fairly well established. The initial outlay should readily be regained by accountants of real ability and personality, however, and a boy who is really keen, and is prepared to work hard, and to sacrifice sufficient of his leisure time to give him a reasonable chance of making a success of his life, will have excellent prospects.

The qualified accountant may commence practice on his own account, or he may seek a situation in which to make good use of the knowledge and experience he has gained while qualifying for his profession. In many respects the first of these alternatives is the more attractive, but naturally it involves a little risk, and in any case it is scarcely likely that a newly-opened practice will be very remunerative.

A plan that is very largely followed is that of purchasing an interest in an existing practice. Accountants already established in practice sometimes find that work in their offices increases beyond the limits of their capacity, and in consequence they may be prepared to take in as partners young men possessed of the necessary qualifications. Similarly, changes in the constitution of a firm due to the retirement of older principals creates opportunities for others. The outlay of the sum necessary for the purchase under these circumstances of an interest in a firm of good standing will bring returns immediately.

If the purchase of a partnership is not feasible, and a suitable opening for commencing practice does not present itself, a newly-qualified accountant may enter the employ of an established firm as a qualified assistant. In a position of this kind he will be called upon to carry out responsible duties. The performance of these will help to widen his experience and at the same time he will gain in confidence and capacity to deal with affairs in general. This will be of the greatest value to him if in a few years' time he decides to set up on his own account, or secures a partnership.

The remuneration that a qualified accountant may expect while in employment of this kind is of interest. Generally speaking, a commencing salary of about £250 per annum may be expected, and this will increase in proportion to his usefulness and ability. If he rises to the position of managing clerk or its equivalent, a considerably larger salary may be obtainable. There are, in fact, many well paid posts open to the right man, but naturally the rewards of service of this kind are not so high as those that may be gained in independent practice.

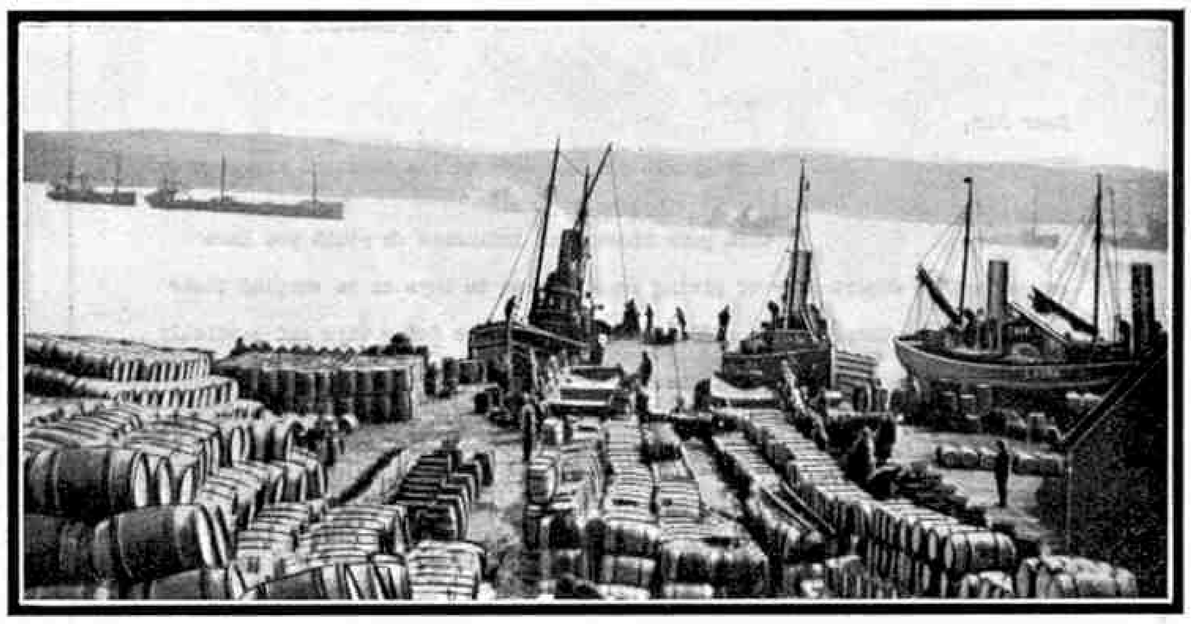
From Our Readers

These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for these pages are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

The Shetland Islands

To most people it comes as a great surprise to learn that the Shetlands consist of more than 100 islands. These are about 120 miles north east of Duncansby Head, in the extreme north of Scotland. The largest is known as Mainland. It is 50 miles in length and at its greatest width is about 20 miles across.

Lerwick, the capital, is situated on the east coast of Mainland, and is of great importance as a centre of the fishing industry. During the herring season, which lasts from July to September, from 500 to 600 boats make the town their centre. The harbour then presents an interesting sight, for the quays are crowded with women who gut and sort the herring as soon as they are landed, and with the barrels in which the fish are packed. The close of the herring season by no means brings activities to an end, for haddock fishing immediately begins and this continues until about June.



A busy scene in Lerwick Harbour during the herring season. Herrings landed from the drifters are cleaned, salted and packed in the barrels shown on the pier.

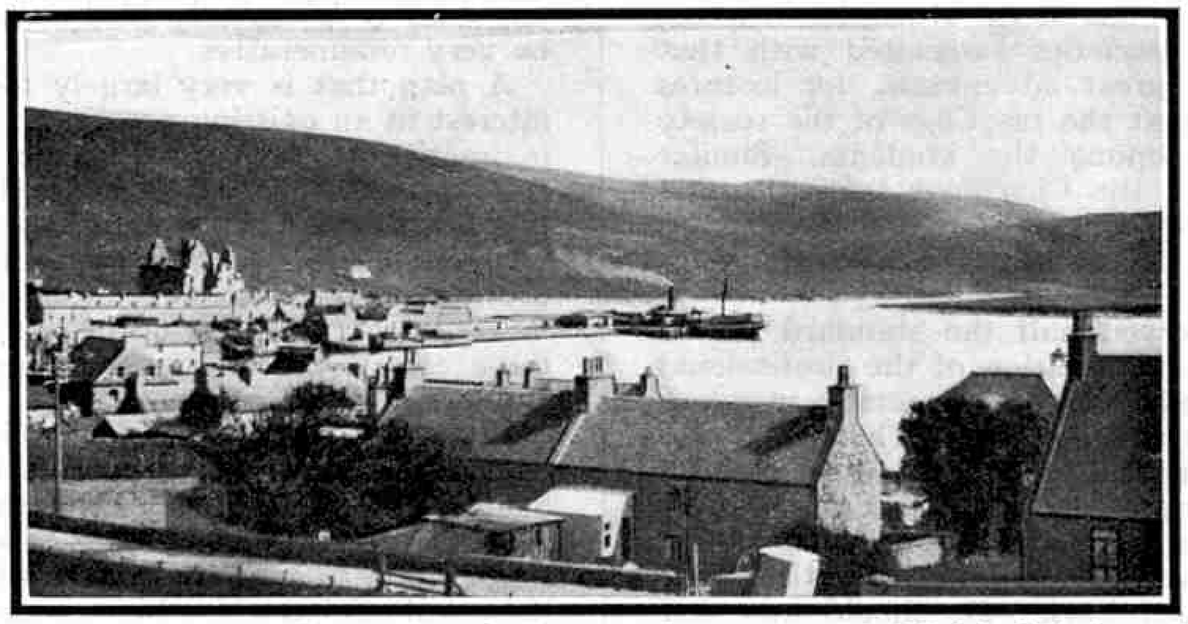
To a visitor one of the most attractive features of Lerwick is the Annual Torchlight procession called the "Up-Helly-AA." This is led by an individual attired in old Norse war dress. He is called the "Guizer Jarl," and stands in a galley that is followed by a crowd of "guizers" or revellers with lighted torches. After marching through the town the galley is burned and the revellers then disperse, to complete the celebrations with dancing and merriment.

On the opposite side of the island to Lerwick is Scalloway, the ancient capital. This stands between two hills at the south end of the Tingwall Valley. Scalloway also is a centre of the fishing industry, and it is further distinguished by the presence of the ruins of an imposing castle built in the days of Queen Mary by Patrick Stewart, then Earl of Orkney. A few miles up the valley stands Tingwall, the burial place of Scalloway and also the scene of a well-known Annual Show of animals and hosiery.

The islanders are a thrifty and hardworking race. If it is at all possible to take out their boats the men fish. The women left at home are never idle and are never seen without their knitting after they have completed their household tasks.

The road from Lerwick to Scalloway runs through the peat hills and at the time of the year when this is being dug an interesting sight is afforded to the traveller. The peat is cut out and piled up in slabs to dry. These are then carried to the road in straw baskets called "kiskies," and are transferred to the lorries. On these they are conveyed to the islander's homes, where they are stacked up ready for use as fuel for household fires during the winter.

T. EVANS (Scalloway).



The mail steamer alongside the pier at Scalloway, on the western coast of Mainland, the largest of the Shetland Islands.

An Australian Delicacy

The so-called "Blackfellow's Bread" is a delicacy that is greatly enjoyed by the aborigines of Australia. It is really a fungus known to science as *Polyporus Mylitta*, and it is found beneath the surface of the ground at depths ranging from an inch to several feet. It is brown or black, and when turned up by the plough or spade has a smooth skin that becomes wrinkled as the fungus dries. When cut across in a fresh state it is found to resemble cheese in consistency, but when thoroughly dry it can only be cut with an axe or a saw. So hard does the fungus become, in fact, that farmers and bushmen have been known to use it for pipe bowls, these being carved to shape while the strange material is fresh and soft.

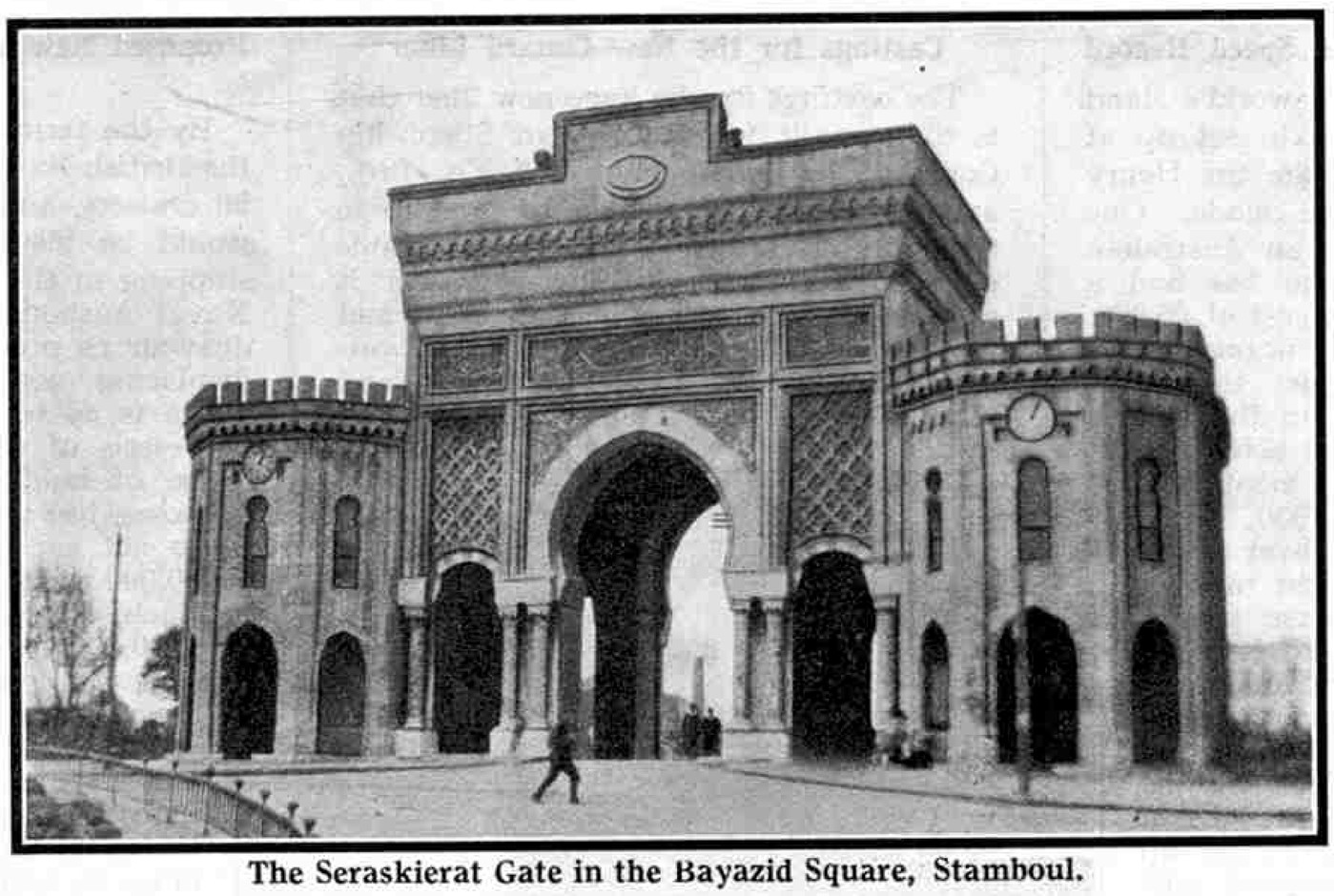
Blackfellow's bread is not very attractive to the white man, for to them it appears to have little flavour. In taste it faintly resembles the coconut and cooking does not improve its attractions. A subterranean fungus that is found in several European countries is the truffle. The best varieties of this grow in France and Italy. They have characteristic odours, and pigs and dogs have long been trained to point out the places where they may be obtained.

P. COLLAS (Melbourne).

Historic Stamboul

Constantinople, or Stamboul, as it is now called, is full of historic relics. An excellent example is the chain that was stretched across the entrance to the Golden Horn during the siege of Constantinople by the Turks in 1453. Constantine XIII, the last Emperor of the Greeks, was anxious to prevent the assailants from taking their ships up the Golden Horn, for this waterway runs along the north side of the city, and if the Turks had entered it they would have been able to attack the walls over the whole circuit. The chain was an effective obstacle, but became practically useless when the Turks dragged ships five miles overland in order to launch them into the Golden Horn above the city.

The chain is now in the Imperial War Museum, and this building illustrates the amazing changes that have taken place in this ancient city. Originally it was the Christian church of St. Irene, but when the city was captured it became the armoury of the famous household troops known as the Janissaries. In 1826, this corps was annihilated by Mahmoud II, and the building was then transformed into a museum of ancient armour.



The Seraskierat Gate in the Bayazid Square, Stamboul.

I was greatly attracted by the Seraskierat Gate, which stands at the entrance to the former seat of the Government of Turkey. It is beautifully inlaid with highly glazed porcelain tiling and gilt inscriptions in Arabic characters. It stands in a square that is named after the mosque erected by Sultan Bayazid the Second. A Greek architect designed the building and it is said that when the Emperor asked him if he had done his best he replied that he had—for the money that he had been paid! Thereupon the angry Sultan immediately had him beheaded.

E. WHITTAKER (Leeds).

A Visit to a Steelworks

Some months ago I had the opportunity of visiting the Dalziel Steel Works, Motherwell, where the metal for the Tay Bridge, and part of that for the Forth Bridge was made. These works also produced steel for use in building many giant liners, including the "*Lusitania*," the "*Aquitania*," and the "*Olympic*."

On entering the works I was taken to watch the loading of the giant furnaces in which the steel is made. Pig iron and scrap iron had been brought by rail and piled in enormous heaps near the furnaces, and from there the metal was lifted into the charging machines by a huge electro-magnet. The process of converting the mixture into steel takes about 11 hours, and the temperature to which it is heated is about 1,600°C. Some of the furnaces are heated by gas, the supply of which is regulated automatically, and others by pulverised coal.

While I was watching the charging of one furnace, a workman informed my guide that another was about to be tapped. Hurriedly we went along to watch the operation. The men prodded gingerly with bars at the foot of the furnaces and sprang back suddenly when the liquid steel gushed out in a dazzling stream. Without the blue glasses with which I had been provided, it would have been impossible to look at the white hot metal, which radiated intense heat as it poured out into the great ladle placed to receive it.

Other departments of the works that I visited were the plate mill and the bar mill, in which were installed machines that handle enormous red hot ingots with great ease. I also saw an enormous shearing machine that cuts steel plates as easily as a piece of paper may be cut by means of a pair of scissors, and in the shops I watched many interesting planing, grinding, drilling and welding machines at work.

In many respects the most attractive part of the works was the testing shop, where samples of steel are bent and stretched in order to make sure that it is suitable for the work that it is called upon to do. I also visited the laboratories. There I saw chemists at work finding the amounts of carbon, phosphorus and sulphur in the steel. Carbon is a very important constituent of steel, and also of various forms of cast iron, and very slight changes in the proportions of the element present in these metals change their properties to a remarkable extent. Sulphur and phosphorus are to be regarded as impurities. Other experts in the laboratories were engaged in etching highly polished sections of the metal by means of various reagents before examining them under a microscope, and I was told that invaluable information on the composition and properties of iron and steel may be obtained in this manner.

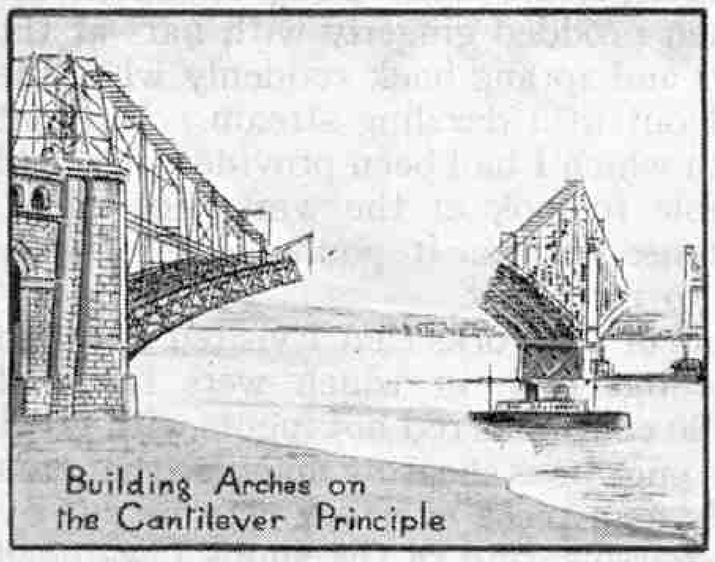
M. MCALLISTER (Glasgow).

A "Meccano" Pit

About two miles from my home there are two collieries owned by the Consett Iron Company. There is nothing unusual about one of these, but the second is known throughout the district as the "Meccano Pit." The reason for this is that it is built on a much smaller scale than its neighbour, and it may almost be described as a colliery in miniature, exactly as Meccano Model-building is "Engineering in Miniature."

The cage of the Meccano Pit is a single decker and holds only four men, while that of the other pit owned by the Company has two decks and at each descent takes 28 men to the bottom of the shaft. There is also a great difference between the amounts of coal that may be hauled to the surface at once in the two collieries. In the larger pit four "tubs" of coal may be raised at each haul, two on each deck, but in the cage of the Meccano Pit there is only room for a single tub.

H. RUTTER (Consett).



Engineering News of the Month

Attempts on World's Land Speed Record

Two attempts on the world's land speed record of 231.36 m.p.h. set up at Daytona, U.S.A., by the late Sir Henry Segrave are shortly to be made. One of these is to be made by an Australian driver, Norman Smith, who has had a special car constructed at a cost of £6,000. The power unit of this car is one of the super-charged Napier engines that were produced specially for use in the British seaplanes taking part in the Schneider Trophy Contest in 1929. As mentioned in our issue for April, 1930, these engines normally develop over 1,250 h.p. and have a power weight ratio of about .886 pounds per horse power.

The attempt on the record is to be made at Ninety-Mile Beach, Auckland, New Zealand, where a smooth track 1,000 ft. in width and 36 miles in length is available. The car will be driven "all out" over a distance of about seven miles in order to get up speed, and after the measured mile has been covered, another seven miles will be required in which to slow down. The driver hopes to attain a speed of more than 300 m.p.h.

The other attempt on the record is to be undertaken by Captain Malcolm Campbell, the holder of the world's land speed records over five kilometres and five miles. Captain Campbell's car is named the "Bluebird," and parts of it have been taken from the car, also called the "Bluebird," on which he made his previous records at Verneuk Pan, South Africa. An unusual feature of the car is that the propeller shaft has been placed at the side of the chassis instead of in the centre. This arrangement has been made possible by the fact that no matter which gear is being employed, there is no drive direct from the engine to the rear wheels, the final drive being taken from the lay-shaft of the gear box. Captain Campbell also is making use of one of the Napier engines used in the Gloster seaplanes produced for the Schneider Trophy Contest, and his attempt will be made at Daytona, the scene of Sir Henry Segrave's wonderful achievements.

Record Cargo for Panama Canal

A record cargo was carried through the Panama Canal a short time ago on the British tank motor ship "*C.O. Stillman.*" This vessel had a cargo of 23,000 tons of crude oil and was bound from Talara, Peru, to Bayonne, New Jersey, U.S.A. The greatest cargo previously carried through the canal was one of 22,244 tons of iron ore, which was on board the Swedish ship "*Svealand,*" which is also a motor vessel.

Castings for the New Cunard Liner

The castings for the huge new liner that is to be built for the Cunard Steamship Company by John Brown & Co. Ltd., are to be made by the Darlington Forge Company. This firm has had considerable experience of this class of work, for it was responsible for similar castings and forgings for the "*Mauretania,*" "*Aquitania,*" "*Olympic,*" "*Britannic,*" and other large vessels. The castings required for the new liner will be the largest that have yet been made in any part of the world. The stern frame will be 112 ft. in length and will have an approximate finished weight of 180 tons. The four shaft brackets, which also are being made by this firm, will weigh approximately 215 tons when finished, while the finished weight of the rudder frame is expected to be 112 tons.

In order to carry out the work it will be necessary to enlarge several shops and furnaces. The transport of the castings to Glasgow is expected to give rise to a number of difficult problems, and readers will be interested to learn in due time how it is proposed to overcome the difficulties involved.

Can any of our readers tell us where this interesting old beam engine is or was? We shall be pleased to hear from any reader who is able to give us any information about it.

Proposed New Type of Cruiser for British Navy

By the terms of the Treaty of London the British Navy is only allowed to possess 50 cruisers, and as this number probably would be insufficient to protect British shipping in the event of war, the British Naval authorities have decided to endeavour to produce a new type of vessel displacing not more than 2,000 tons. There is no restriction in the Treaty for vessels of this size. They would not be of much value for offensive purposes, but would be quite large enough to act as convoys and to patrol the 80,000 miles of Empire trade routes. Each ship would cost only about £500,000 to construct.

If the designs now being considered are adopted, the cruisers will be fitted with internal combustion engines. They will have a speed of 17 knots, and their fuel capacity will be sufficient to enable them to make cruises 10,000 miles in length. Each will be armed with 6 in. long range guns, anti-aircraft guns, and depth charge throwers, and it is probable that a seaplane to be launched by means of a catapult also will be carried.

New Automatic Traffic Signal

An interesting automatic traffic signal has been produced by the Westinghouse Electric International Company in order to prevent waste of time at little-used street crossings. Normally traffic on the main road is given the right of way by this signal, which causes a red light to hold up this traffic only on the approach of a vehicle on the intersecting highway.

The signal is worked from a small pedestal, about 3 ft. in height, from the top of which a beam of light is directed upon a photo-electric cell mounted on the opposite side of the street. Alongside the cell is a notice that reads: "Stop opposite this sign." When this order is obeyed the beam of light is cut off from the cell. This brings into action a relay, with the result that red lights are shown on the traffic signal to vehicles passing up and down the main highway. These remain at "Stop" for an interval of sufficient length to enable the motorist from the side street to cross, after which the signal is again set to allow free movement to traffic on the main road.

Many of these signals are now in use in the United States. They are quite automatic in action and while allowing occasional motorists from side streets to cross the highroads in safety and comfort, they keep the main line of traffic moving rapidly.

New Bridge for Middlesbrough

A new vertical lift bridge is to be constructed across the River Tees at Newport, Middlesbrough. It is to be built by Dorman, Long & Co. Ltd., and its total cost, including the price of the necessary land, is estimated at £616,000.

The new bridge will have a central lift span 250 ft. in length. Normally this will be at a height of 28 ft. above high water level, and when necessary in order to allow ships to pass underneath, it will be raised to a height of 160 ft. by means of electric motors. The four hollow steel towers carrying the lift span will be 200 ft. in height. The bridge itself is to be 66 ft. in width between parapets. Of this width, the roadway will take up 38 ft. and the remainder will be accounted for by two footpaths.

Dorman, Long & Co. Ltd. have also secured the contract for the construction of a new bridge over the River Foyle at Londonderry, Ireland. This bridge is to replace the existing Carlisle bridge, and the contract calls for completion in 2½ years. The new Londonderry bridge will be 1,260 ft. in overall length and will be made up of five spans each 130 ft. in length, and 17 approach spans. It is expected that about 6,000 tons of steel will be used in its construction, while the estimated total cost is £255,510.

Deepening the St. Lawrence River

Preliminary work is now being carried out on the cutting of a 35 ft. waterway in the bed of the St. Lawrence River below Montreal. The channel to be dredged will have a width of 500 ft. where the river follows a straight line, and at curves it will be widened to 1,000 ft. It will therefore be sufficiently wide and deep to be negotiated by large ocean liners. If no unforeseen obstructions are encountered, the work will be completed by the end of 1933.

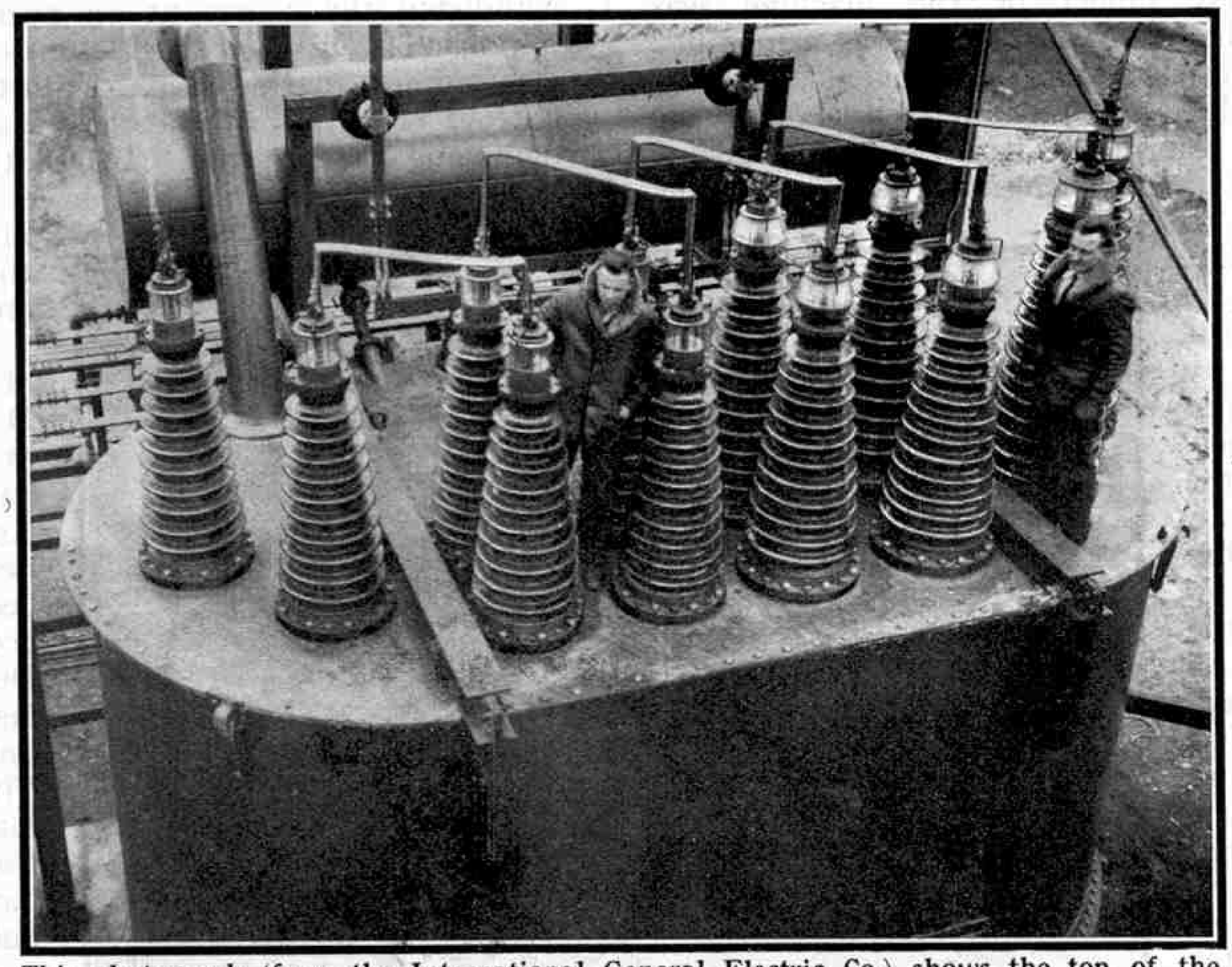
At present 13 dredgers are at work, 11 of which are operated in the channel, 160 miles in length, between Montreal and Quebec. It is expected that eight more will be put into service next year, and eventually 19 large dredgers will be at work on this section. The only other place where work is at present being carried out is in the North Channel to the east of Ile d'Orleans, below Quebec, where two dredgers are employed.

About 8,000,000 c. yds. of earth and rock will be removed during the widening and deepening of the river. One half of the work is to be done by the Government Marine Department and the other by a firm of contractors. In order to speed up the project, the Marine Department has ordered two dredgers, while five are being built for the contracting firm sharing in the work, and are expected to be ready shortly.

Diesel Lorry's 440-Mile Non-stop Run

A four-ton commercial lorry recently completed the 440-mile non-stop run between London and Glasgow at a cost of 7/6 for fuel! The lorry was constructed by Laffly Municipal and Commercial Motors and it was fitted with a two-cylinder Diesel engine of the two-stroke type.

The journey was made to demonstrate the reliability of a Diesel-engined lorry over a long distance. It was made non-stop and under bad conditions. Fog was encountered twice, and there was much ice on the road over Shap Fell, but the lorry gave a very creditable performance. The journey was expected to occupy 22 hours at an average speed of 20 m.p.h., but Glasgow was reached two hours before the calculated time. The average speed therefore was nearly 25 m.p.h. This is remarkably high, for the maximum speed of the vehicle is only two miles an hour greater than this.



This photograph (from the International General Electric Co.) shows the top of the giant 200-ton transformer built by the International General Electric Co. for testing purposes. A description of the transformer was given on page 13 of our January issue.

New Motorship for Blue Funnel Line

A new large motorship was recently launched for the Blue Funnel Line. The vessel, which is called the "*Ajax*," is 453 ft. 6 in. in length and has a beam and depth of 59 ft. Her displacement is 7,800 gross tons and she is fitted with supercharged airless ignition propelling machinery developing 8,600 b.h.p. at 110 r.p.m. The vessel is equipped with 24 electric winches and 28 derricks, the largest of which is capable of lifting a load of 60 tons. She is fitted with a protective bow.

The "*Ajax*" is the third vessel of that name to be owned by the Blue Funnel Line. The first one was launched in 1866. She displaced 2,279 tons and was fitted with steam engines developing 822 i.h.p. The second "*Ajax*" was completed in 1900, and was much larger and more powerful, for she had a displacement of 7,039 gross tons and her machinery developed 4,200 i.h.p.

Nearly Eight Million Miles of Roads

A census of the world's roads carried out by the United States Department of Commerce shows that in 1929 the total length of these was no less than 7,805,629 miles. This length is sufficient to encircle the earth round the equator about 312 times. It is interesting to know that since 1928 nearly 1,225,000 miles of new roads have been constructed.

The United States heads the mileage list with 3,727,393 miles of roads. Europe comes next with 2,450,439 miles, and actually has a greater length of roadway in proportion to area than any other continent. This continent also has the greatest mileage of good hard roads, for 2,764,959 miles of the American total represent third-rate or country roads, of which type there are only 58,098 miles in Europe.

In spite of their size the remaining continents compare badly with those already mentioned. Asia has 1,014,014 miles of roads, of which 578,888 miles are of the unimproved earth type. The roads of Africa are only 262,920 miles in length. Australia, large areas of which are as yet undeveloped, of course, has nearly 350,900 miles of highway, a total that is practically equalled by New Zealand.

Petrol Line 760 Miles in Length

A pipe line 760 miles in length is now being built in America to carry petrol from the portion of Texas known as the Panhandle to St. Louis. This will be capable of carrying 30,000 barrels of petrol per day, and on its arrival at St. Louis this will be transported to other centres by tankers on the Mississippi River. The line is being constructed in order to speed up the delivery of the petrol to consumers.

About 15 booster stations will be constructed along the line. At these petrol will be taken out at a pressure of about 50 lb. per sq. in. and put back into the line with the pressure increased to nearly 800 lb. per sq. in. The pumps that will do this work will operate at very high speeds. They will be driven by gas engines, the fuel for which will be obtained direct from the oil fields of Texas and will be sent along the pipes in liquid form at intervals.

1930 Shipping Record

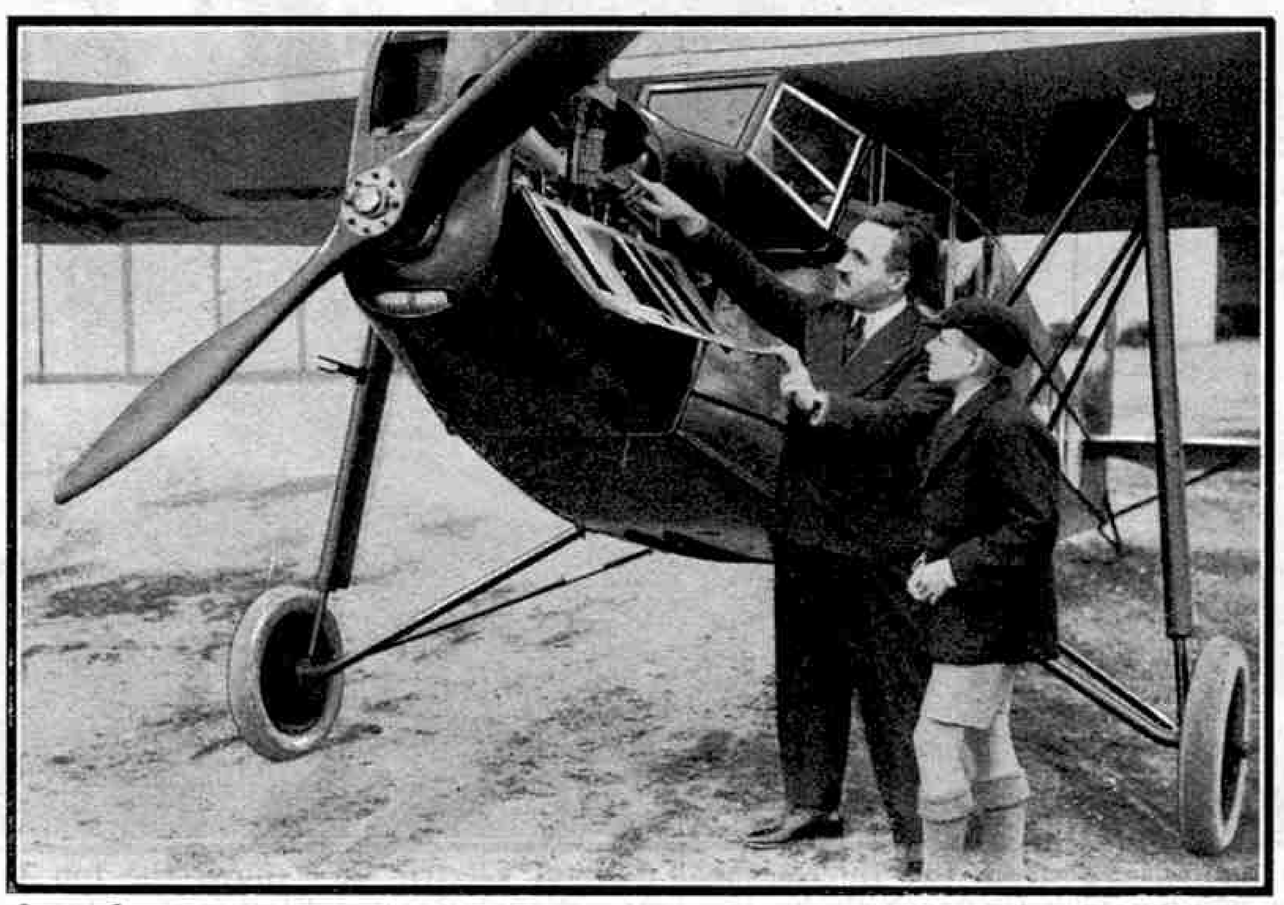
In spite of the general trade depression of last year, the gross tonnage of vessels launched during 1930 from the shipyards of Swan, Hunter and Wigham Richardson Ltd. amounted to 213,229 tons. This is the largest annual output yet recorded by this firm and is 51,772 tons more than the figure for the previous year. The previous record was established in 1927, when 186,774 tons of shipping were launched. Many of the ships launched last year were constructed for foreign firms.

The Desoutter Sports Coupé

A Three-Seater High Wing Monoplane

THE Desoutter Sports Coupé is a monoplane of a type that promises to become very popular with private owners, for its cabin is roomy and gives adequate protection in all kinds of weather to its occupants. The first model of the machine was produced towards the end of 1929. It was a modified and improved form of the Dutch Koolhoven "F.K.41," and was the first three-seater cabin monoplane to be produced in this country. The standard machine was fitted with the "Cirrus Hermes" engine, details of which were given on page 34 of the "*M.M.*" for last month.

The Desoutter Sports Coupé was followed by the Mark II, the first machine of the new type appearing in the summer of last year. This also is a cabin monoplane and is noteworthy as one of the aeroplanes in which an inverted engine is fitted. Both Desoutter models have the useful feature that with few alterations they may be adapted to different purposes. They may be used as ordinary three-seater private machines or fitted with dual control apparatus to be employed as two-seater craft. They are also of great value as fast freight and mail carriers, photographic and air survey machines, or as single or double ambulance aeroplanes.



Courtesy] [*Desoutter Aircraft Co. Ltd.*

Mr. Marcel Desoutter, Managing Director of the Desoutter Aircraft Co. Ltd., explains the working of a modern aero engine to Denis Desoutter. Readers of the "Meccano Magazine" will be interested to learn that Denis is a keen Meccano enthusiast.

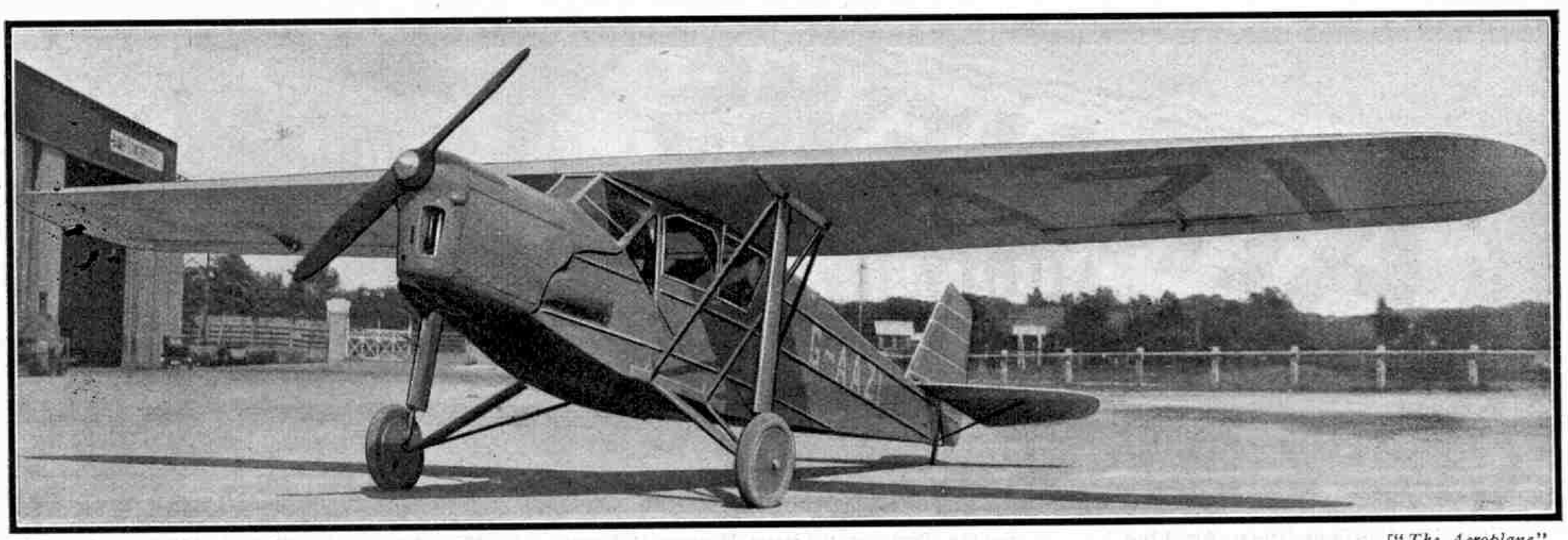
Although it is little more than a year since the first Desoutter machine appeared it has already distinguished itself in a number of notable flights. One of the most interesting of these was that to Australia carried out by Flying Officers H. L. Piper and C. Kay. This flight was mentioned in the article dealing with the "Cirrus" aero engine on page 34 of last month's "*M.M.*" It was commenced at Croydon on 9th February, 1929, and Port Darwin, the chief town and harbour of Northern Territory, Australia, was reached on 24th March. The flight may be regarded as an aerial touring holiday, for no effort was made to beat any records. The machine was the first cabin monoplane to fly to Australia from this country, and the reliability of the aeroplane is shown by the fact that the two airmen used a standard production machine taken from stock, the only modifications being the addition of an extra petrol tank and the streamlining of certain exposed fittings.

In last month's issue reference also was made to the Desoutter machine, fitted with a "Cirrus Hermes" engine, which Mr. C. Bernard Wilson flew to Baghdad and back in 62 hours' flying time, thus maintaining an average speed of more than 90 m.p.h. Mr. Wilson's machine was flown in the King's Cup race of 1930, and completed the course at an average speed of 108.04 m.p.h. The first of the Desoutter Mark II type also was entered in this race. Unfortunately the machine got out of control at Manchester and ran into a hedge, damaging the airscrew. Up to that time an average speed of 120.5 m.p.h. had been maintained, and the mishap probably robbed the machine of a place among the leaders.

The good qualities of the Desoutter Mark II were better displayed at the 11th International Meeting of the Antwerp Aviation Club, held in September of last year. On that occasion one of the new Desoutters set up the fastest time in the Concourse de Grande Vitesse. The same machine also won the third prize for aerobatics, although it is only a cabin touring aeroplane, and was competing against German machines that were specially designed to take part in displays of this kind.

It is interesting to note that a Desoutter Mark II was used by Dr. Hugo Eckener, the famous airship designer, on his flight from Croydon to Flushing after giving evidence at the enquiry into the "R101" disaster. Dr. Eckener and his first officer, Captain von Schiller, had missed the boat train from London, but the aeroplane carried them to Flushing in time to board their train to Berlin. Dr. Eckener wrote to the constructors of the Desoutter to congratulate them upon the comfort of the machine and he particularly mentioned the excellent view that may be obtained by the occupants of any of the three seats.

In addition to being extensively used in this country, Desoutter aircraft have been exported to Australia, New Zealand, Hungary, Ireland and Canada. The first machine sent to Canada was immediately assembled and flown on a 2,000-miles tour. The strength and airworthiness of the machine was thoroughly tested on this trip, for it occurred during one of the worst blizzards that has swept the prairies for many years. The machine avoided the worst of the blizzard, but fierce snow storms and general bad weather were experienced. These caused no damage, however, and on the return flight, a distance of 860 miles was covered



Courtesy] ["*The Aeroplane*"

The latest model Mark II Desoutter fitted with a 120 h.p. "Gipsy III." The greatly improved tail unit of this machine should be compared with that of the Mark I type illustrated on page 34 of our issue for January.

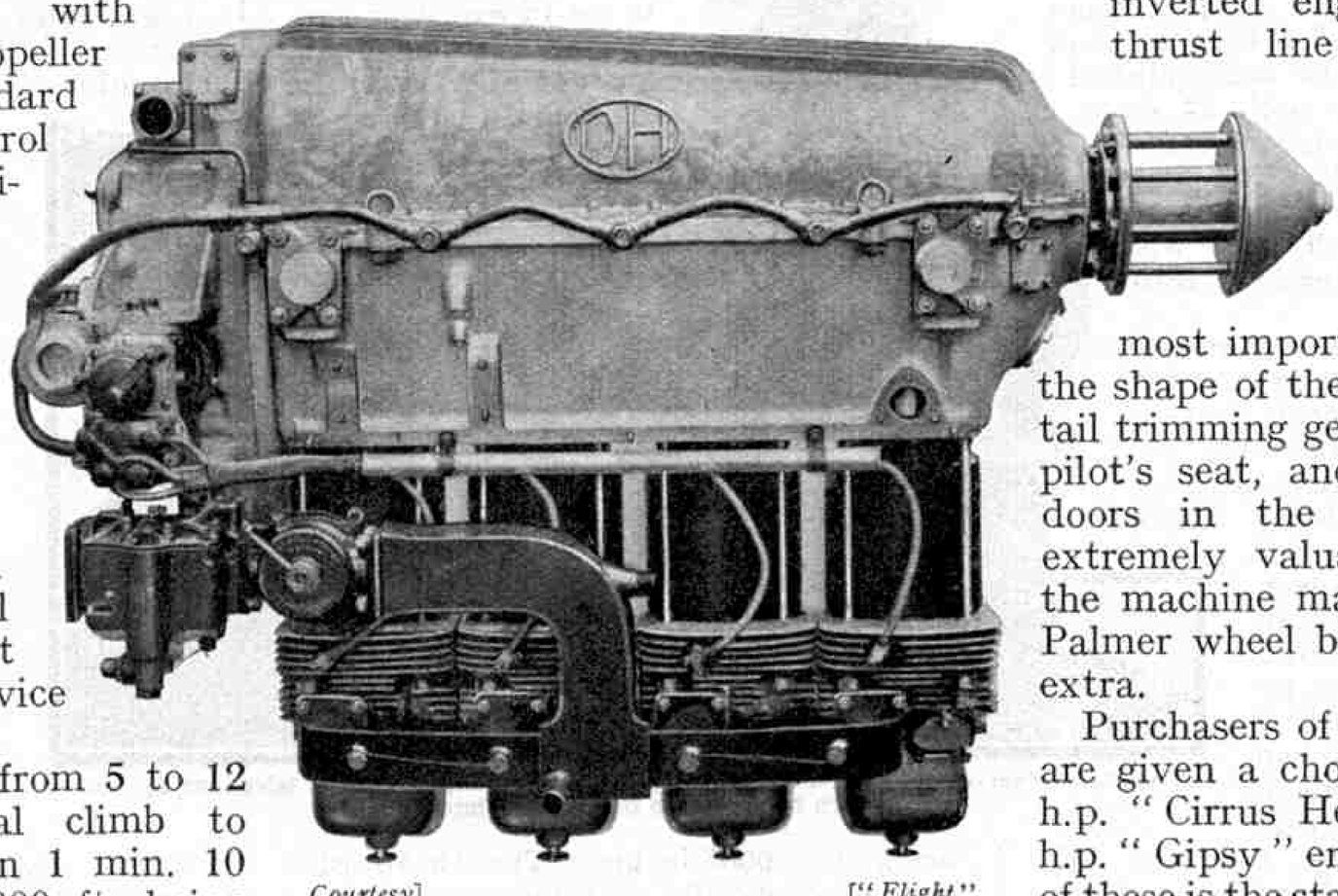
in the remarkably short time of 6 hrs. 20 min.

The Desoutter Mark I machine is a high wing monoplane fitted with three seats inside an enclosed cabin. The seats are arranged so that the pilot sits in front with the two passengers side by side behind him. The machine has a wing span of 35 ft. 6 in., and a wing cord of 5 ft. 9 in., tapering to 4 ft. 10 in. The wing area is 180 sq. ft. The Desoutter is 26 ft. in length and 7 ft. 6 in. in height. It is exceptionally stable when taxi-ing over rough surfaces, this feature having been secured by providing a wheel track 10 ft. in width. The machine is constructed of wood, and except for the rudder and elevator is completely covered with plywood. A wooden propeller is provided and the standard instruments consist of petrol and oil gauges, an altimeter, revolution counter, cross level and an air speed indicator. The standard petrol tank will hold 25 gallons, but if required a 33-gallon tank can be fitted. A useful feature is that the machine can be fitted with removable dual control apparatus that makes it suitable for service as a training craft.

The take off occupies from 5 to 12 seconds and the initial climb to 1,000 ft. is completed in 1 min. 10 seconds, a height of 5,000 ft. being attained in 7 min. 30 seconds. The ceiling of the machine varies from 16,000 to 18,000 ft. The machine has a maximum speed of from 111 to 115 m.p.h., while it cruises at 96 to 100 m.p.h. and lands at from 45 to 50 miles an hour. Petrol consumption at cruising speed is only six gallons per hour and this gives the machine a range of from 400 to 500 miles.

The Desoutter monoplane weighs approximately 1,100 lb. when empty, and 1,900 lb. fully loaded. This gives a disposable load of 800 lb.

The Mark II model shows several improvements over the Mark I. For instance, the fuselage has been made four inches less in depth, but this does not reduce the amount of head room for the passengers. It has also been slightly narrowed where the pilot sits, but the width at the passengers' seats remains the same. These alterations have greatly improved the streamline form of the machine. The Mark II is fitted with an inverted engine. This step has greatly improved the view from the pilot's seat, and the front and side windows of the cabin have been brought considerably lower down for the same purpose. The inverted engine has also made it possible to shorten the chassis legs, and when the machine is at rest the cabin is therefore closer to the ground than is the case with the Mark I model. Another improvement aerodynamically is that the use of an inverted engine has raised the thrust line of the propeller, bringing it almost in line with the centre of resistance of the machine. Among other alterations the most important are a change in the shape of the fin, the provision of tail trimming gear operated from the pilot's seat, and the fitting of two doors in the fuselage, while an extremely valuable feature is that the machine may be equipped with Palmer wheel brakes as an optional extra.



Courtesy] ["*Flight*"

A starboard view of the 120 h.p. inverted "Gipsy" engine, with which the machine shown in the illustration at the top of the page is equipped.

Purchasers of a Desoutter Mark II are given a choice between the 112 h.p. "Cirrus Hermes" and the 120 h.p. "Gipsy" engines, but the second of these is the standard unit employed. Whatever engine is fitted, a vertical or inverted model may be used, the selection depending on the personal tastes and requirements of the owner.

The Mark II Desoutter has a wing span of 35 ft. 8½ in., while the maximum width of the wing cord is 5 ft. 8 in. This gives a total wing area of 183 sq. ft. The overall length is 26 ft., the height 7 ft., and the wheel track only 8 ft. 4 in. The empty weight of the machine is approximately 1,200 lb. while the gross weight is 2,000 lb. This gives a disposable load of 800 lb., and as the normal petrol and oil required for a cruise of 450 miles weighs about 200 lb., the useful load of the machine is 600 lb.

The maximum speed at ground level (*Continued on page 168*)

The London-Cape Town Air Line

The North African section of the Imperial Airways new London to Cape Town air route, which was mentioned in the "Air News" pages of our last month's issue, will be opened for traffic on the 5th of next month. The inaugural flight will start from Cairo on that day, and the 2,760-mile journey to Mwanza, Tanganyika Territory, will be completed by 9th March. Twelve intermediate stops will be made, and following on the initial flight, a weekly service in each direction will be operated, but passengers will not be carried south of Khartoum.

The Imperial Airways liner leaving London for the East on the 28th of this month will establish connection with the North African section on the opening day of the service. The total distance from London to Mwanza is 5,114 miles, and the through flight will be accomplished in nine days, compared with 24 days occupied when the journey is carried out by surface transport. The first return flight from Mwanza is to start on Tuesday, 10th March, and will reach London on Wednesday, 18th March.

Before the new 39-seater Handley Page "Hannibal" air liners are put into service, the European section of the route will be operated by machines of the Armstrong Siddeley "Argosy" type, while Short "Calcutta" flying boats will be used on the Mediterranean section. The North African section between Cairo and Khartoum will be flown by "Argosies," and "Calcutta" flying boats will carry on along the Nile and the African lakes to Kisumu and Mwanza.

Imperial Airways hope that the full 8,000-mile route from London to Cape Town will be in regular operation by May or June of this year.

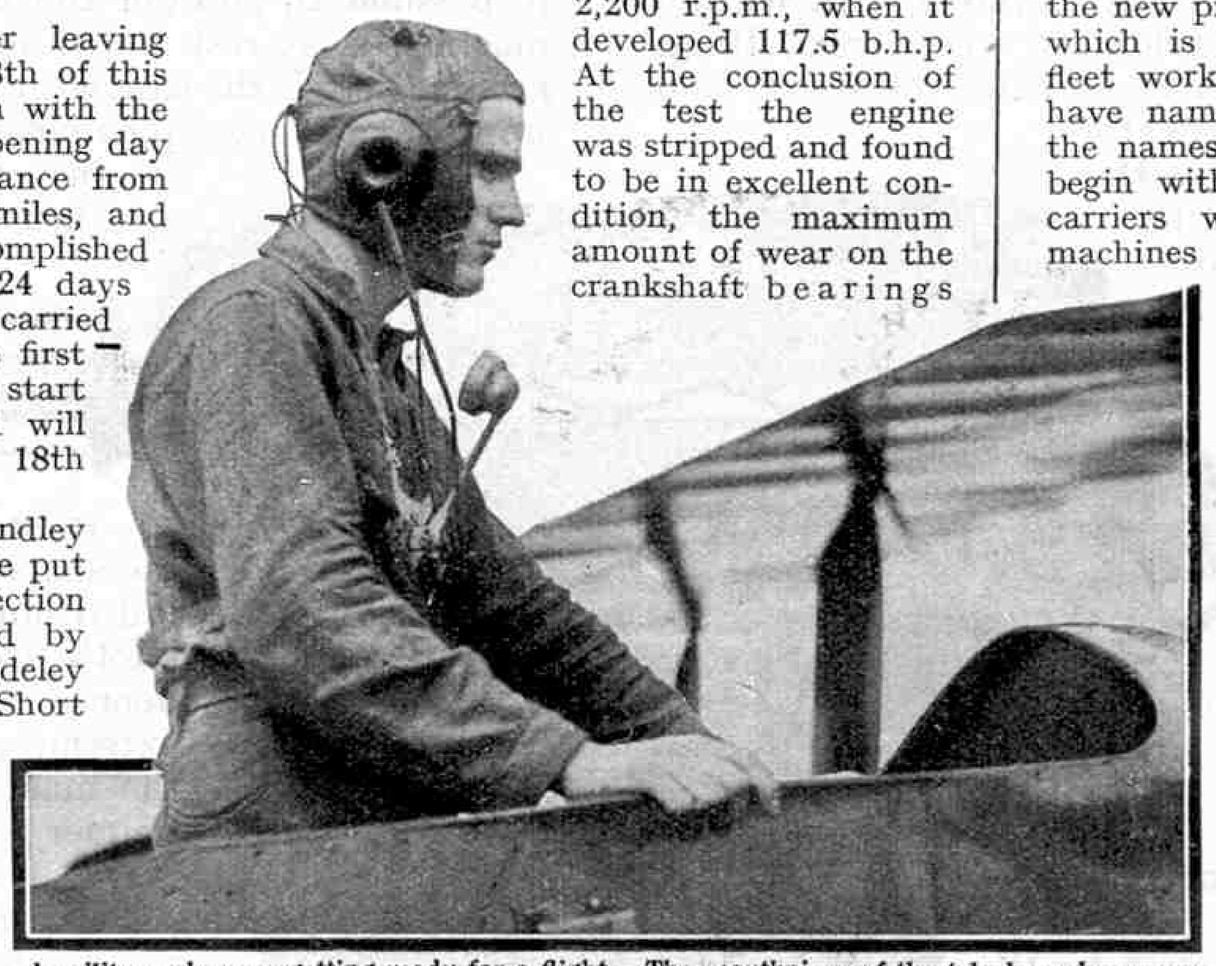
Pleasure Flights Across London

An interesting scheme to popularise aviation is shortly to be put into operation by Imperial Airways. Under this scheme an Imperial Airways motor coach will pick up parties of twenty people anywhere in London and take them to Croydon Aerodrome, where they will be shown over the buildings by an official guide. The members of the party will then go on to the aerodrome itself and enplane in an "Argosy," or any other air liner available in which they will be taken for a flight over London. It is stated that the cost of the trip will be 10/– for each person.

Severe Test for "Cirrus Hermes" Engine

A development type test, during which a standard "Cirrus Hermes" Mark II engine was run for 100 hours at 2,000 r.p.m., was carried out a short time ago under Air Ministry supervision by Cirrus Aero Engines Ltd. The purpose of the test was to obtain a new power rating at higher revolutions.

The engine used was standard in all respects and throughout the trial it developed 110 b.h.p. After the scheduled time had been completed the engine was subjected to a further period of running at 2,200 r.p.m., when it developed 117.5 b.h.p. At the conclusion of the test the engine was stripped and found to be in excellent condition, the maximum amount of wear on the crankshaft bearings being only .0005 inches. The Air Ministry have now officially confirmed that the test was successful and that it is quite safe for "Cirrus Hermes" engines to be operated at a normal speed of 2,000 r.p.m., with a maximum of 2,200 r.p.m. The makers claim that this is the most severe test ever successfully undergone by any low power engine of similar type.



A military observer getting ready for a flight. The mouthpiece of the telephone by means of which he speaks to the pilot is plainly visible.

Berlin-Baghdad Mail Service

A new air mail service between Berlin and Baghdad to be inaugurated this year by Deutsche Luft Hansa will make it possible for mails to be carried between the two cities in 48 hours. The mails will only be flown from Vienna and they will be taken to that city by rail overnight. The service may be linked up with the London-Berlin service.

New Names for British Military Aircraft

In "*Air News*" of the "*M.M.*" for December we stated that the name of the Hawker "Hornet" had been changed to "Fury" in order to conform with a new system of naming adopted in the R.A.F., by which all new fighting machines are to be given names beginning with "F." We are now able to give the full list of initial letters that are to be used on various types of machines.

All fleet fighters will in future have names beginning with "N." The first machine in this series to be named on the new principle is the Hawker "Norn," which is a Hawker "Fury" used for fleet work. Single-engined bombers will have names beginning with "P," while the names of multi-engined bombers will begin with a "B" and those of troop carriers with a "C." The names of machines of Army co-operation type will have "O" as the first letter, and torpedo bombers are being given names beginning with "M." The initial letter "S" will distinguish fleet spotters and reconnaissance aircraft, and "R" will be used similarly for coastal reconnaissance machines and flying boats. Names beginning with "G" and "T" respectively will be given to general purpose and training aircraft.

Air Liners' Long Service

Three De Havilland "Hercules" air liners that were built in 1926 for service on Imperial Airways' middle east route have flown a total distance of 532,257 miles in 6,152½ flying hours since 1927. The machine that has done the most flying is G-EBMX, "*City of Delhi*," which has 182,152 miles and 2,105½ flying hours to its credit. The liner with the next largest total is G-EBMY, "*City of Baghdad*," which has flown 178,409 miles in 2,075½ hours. G-EBMW, "*City of Cairo*" was in the air for 1,971½ hours, during which time a distance of 171,696 miles was covered.

It is interesting to recall that the name "Hercules" was given to the De Havilland air liners owned by Imperial Airways by readers of the "*M.M.*" A competition for the most suitable name was conducted in the pages of the Magazine during 1926, and the name adopted was the suggestion of the winner, who thus qualified for a 50-mile flight in a D.H. "Moth."

Italian Squadron Crosses Atlantic Ocean

An interesting formation flight to South America was commenced on 17th December, 1930, by twelve Italian flying boats, together with two repair machines. The flight was led by General Balbo, Italian Air Minister, who flew in the first machine of one of the three flights into which the squadron was divided. Ten of the 14 machines arrived safely at Port Natal, Brazil, on 6th January, thus completing the first aerial crossing of the Atlantic Ocean in mass formation. Four of the flying boats were forced down, and five of the occupants were killed. From Port Natal the airmen flew along the coast to Rio de Janeiro, the capital of Brazil.

The Blackburn " Ripon " aeroplane fitted with Napier " Lion " engine. This machine can take off from and alight upon the deck of an aircraft carrier, and is used for bombing and torpedo carrying.

The aeroplanes in which the journey was made are Savoia " S.55," twin-hulled, twin-engined monoplane flying boat bombers. Each machine is equipped with two Fiat " A.22R " twelve-cylinder engines developing from 560 to 600 h.p. The engines are mounted in tandem and are carried in a nacelle above the wing. Each machine weighs 22,050 lb. and carries a mechanic and a wireless operator in addition to two pilots.

The 6,400-mile flight commenced at Orbetello, in Italy, and Bolama, on the west coast of Africa, was reached by way of Cartagena, Kenitra in Spanish Morocco, and Villa Cisneros in Rio de Oro. The ocean route from Bolama to Port Natal is about 1,900 miles in length, and the crossing was made in 16½ hours, giving an average flying speed of more than 112 m.p.h. Six Italian cruisers patrolled the route across the Atlantic, and a number of the airmen who were forced to descend were rescued by one of these vessels.

Record Flight from London to Calcutta

Two French airmen, Captains Goulette and Lalouette, recently broke Wing Commander Kingsford Smith's record for the flight to India. They reached Karachi in 2 days, 11 hours, 15 minutes, which is two days less than the time taken by Kingsford Smith. They flew on to Calcutta, the total flight occupying only 3 days, 9 hours, 40 minutes, compared with Kingsford Smith's time of 5½ days for a flight over the same course.

* * * *

An interesting single-seater monoplane has been built by two members of the Nottingham Flying Club. The design is similar to the Hill " Pterodactyl " and it has been successfully flown by its constructors.

German Airships to Use Helium

Work on the new German airship " L.Z.128 " has been stopped in order that it may be redesigned and modified to make it suitable for use with helium instead of hydrogen. This decision has been arrived at as a result of the " *R.101* " disaster and a promise has been obtained from the United States to supply as much helium as is required. It will be necessary to increase the capacity of the airship from 5,075,000 c. ft. to 5,600,000 c. ft. in order to allow for the difference in lifting powers of the two gases. " L.Z.128 " will carry hydrogen in a small bag and when it is necessary to blow off gas while the airship is in flight, valves in this bag will be opened. Thus loss of costly helium will be avoided. The airship will be fitted with heavy oil engines.

An ingenious ornithopter—a machine that flies by flapping its wings in the manner of a bird—evolved by an American airman, G. F. White of Florida. The machine is designed to be driven by one man by foot power, but it is not recorded that it ever had any success.

Handley Page Slots on Polish Aeroplane

A Polish machine that was displayed at the last International Aero Show at Paris gives a remarkable illustration of the value of the British Handley Page automatic slots. The machine is known as type "L.2," and is a parasol monoplane two-seater of all-metal construction. It is fitted with a 225 h.p. Wright " Whirlwind " engine built in Poland under license, and has been particularly designed to afford safe and easy flying. The machine has a wing span of 43 ft. 11 in., but is only 25 ft. 11 in. in length. The tare and gross weights are 1,935 lb. and 2,820 lb. respectively, making possible a useful load of 885 lb. The machine has a maximum speed at ground level of 110 m.p.h. and the initial climb to 13,120 ft. takes 21.25 minutes. The stalling speed of the machine without slots is 71 m.p.h., but with these fitted along the leading edge of the wing, the stalling speed is reduced to only 39 m.p.h. !

New American Naval Aircraft Carrier

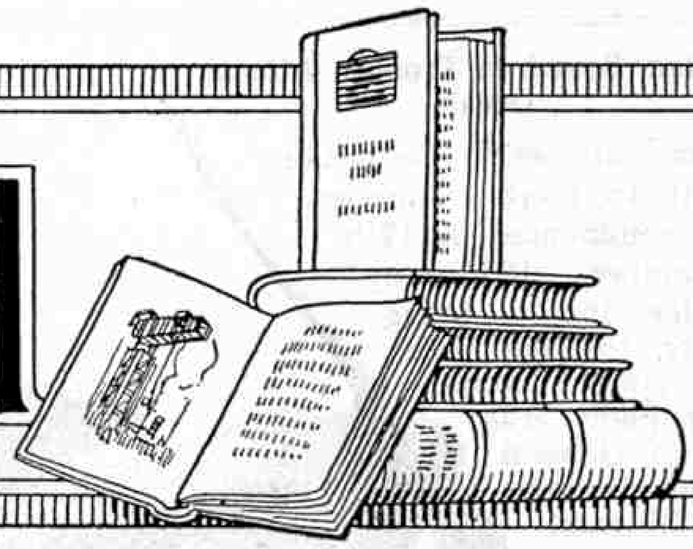
A new aircraft carrier is to be built for the United States Navy. This will have a displacement of 13,800 tons, and the total cost of the vessel will be approximately £3,800,000. The hull and machinery alone is expected to cost £3,132,000, while the cost of the armour and armament is estimated at £688,000. The new vessel will be the first aircraft carrier in the United States Navy that has been built specifically for this purpose.

The United States are also contemplating the construction of a new type of ship that will be a combined cruiser and aircraft carrier. The designs of this vessel show that she will displace about 10,000 tons. She will carry twelve 6 in. guns and a number of anti-aircraft guns and torpedo tubes, and is expected to have a speed of 32½ knots and a cruising radius of 12,000 miles.

New Light Aeroplane Distance Record

A record for a flight in a straight line in a light aeroplane was made a short time ago by two French airmen, Captain Lalouette and M. Permoufle. These airmen covered the distance of 1,800 miles between Istres, Marseilles, and Villa Cisneros, Rio de Oro, in 22 hours, easily beating the previous record of 810 miles held by two Germans. Details of another record, in the making of which Captain Lalouette took part, are given in the first column on this page.

Books to Read



On these pages we review books that are both of interest and of use to readers of the "M.M." We have made arrangements to supply copies of any of these books where readers find difficulty in obtaining them through the usual channels.

Orders should be addressed to the Book Dept., Meccano Limited, Old Swan, Liverpool, and 1/- should be added to the published price of the book to cover the cost of postage. The balance remaining will be refunded when the book is sent, as postages on different books vary according to the weight and destination.

"Gliding and Motorless Flight"

By L. Howard-Flanders and C. F. Carr
(Pitman & Sons Ltd. 7/6 net)

The Pitman publications dealing with various aspects of aviation have already established for themselves a sound position, and this latest volume will certainly add to the reputation of the series. Although gliding has been extensively practised in Germany for some years, it is only recently that this fascinating sport has secured a footing in Great Britain. Now that a start has been made, however, British gliding progress is likely to be rapid, and a reliable account of the methods and practice of the sport is very welcome.

The German revival of interest in gliding dates from 1920, when a remarkable wave of enthusiasm for aviation passed over the country. The progress that has been made since that time may be illustrated best by one or two comparisons. At a gliding competition held in August 1920, W. Klemperer set up a record of 2 min. 22 sec. In 1922 Hentzen, in a "Vampyr," reached an altitude of 350 metres (1,148 ft.), and stayed in the air for 3 hr. 10 min. In 1925 Schultz set up a record of 14 hr. 7 min., and in 1929 Dinort remained in the air for 14 hr. 43 min.

The present position in regard to gliding is summed up by the authors in the following words:—"A pilot can be catapulted into the air at a suitable spot and glide to a distant point, providing there are areas of rising wind to enable him to maintain height. It is quite possible for a pilot to land at a point higher than that from which he took off. In some cross-country flights, pilots, finding that they have lost height, have returned to a spot where there is a favourable rising current and have manœuvred there until they have risen sufficiently high to soar to another point where a rising current is available.

It will thus be seen that the pilot of a soaring glider is very much like a master mariner in a sailing craft; he is entirely dependent upon air currents to transport him from place to place. He has to lay a course, which he is able to judge largely by the lie of the land, in order to take advantage of the prevailing winds. He is entirely at the mercy of the air currents, and his own particular "doldrums" are land areas where favourable currents are entirely absent."

Interesting developments have taken place recently in cloud soaring, in which the glider pilot takes advantage of the rising currents beneath cumulus clouds. Previously gliding could only take place in the neighbourhood of hills that provided the necessary supporting air currents; and a cross-country flight of any length had to be so planned as to enable the pilot to keep himself aloft by following the course of favourable hills. Now a pilot can soar over flat land by flying from cloud to cloud. There is no doubt that the long cross-country soaring flights of the future will be made by a combination of hill soaring and cloud soaring. Remarkable experiments have been carried out in actually flying into cloud. On one occasion the German pilot Groenhoff, flying with a passenger in a two-seater glider, soared through a cumulus cloud to a height of 1,250 metres (4,101 ft.) above the starting point, covering altogether a distance of 33.3 kilometres (20.69 miles). German experimenters have also carried out investigations of the upper air currents by towing gliders by ordinary aeroplanes to considerable heights and then releasing them.

The development of gliding made it necessary to institute some kind of official supervision, and this has been done by the British Gliding Association. A training system has been evolved including three degrees of pilotage. In order to obtain certificate "A," candidates who have previously made at least twelve glides must carry out a flight for a duration of 30 sec., followed by a normal landing. For certificate "B," candidates must have carried out two flights each of a duration of at least 45 sec., and must make a flight of one minute with two curves in the form of an "S," with a normal landing at the end. Certificate "C" is issued to candidates who carry out a flight of not less than five minutes at a height greater than that of the point of departure. The system of gliding tuition usually followed in this country is modelled on that in use in Germany, particularly at the flying school at the Wasserkuppe, which may be regarded as the home of modern gliding. This school, which is situated in the centre of an ideal gliding country, has facilities for boarding over forty pupils, and is thoroughly equipped in every respect.

Interesting chapters are devoted to the organising and running of a gliding club, with practical advice on choice of ground and the care of gliders. The different types of gliders are explained in detail, and various meteorological factors that affect gliding are discussed.

The numerous illustrations from photographs are of great interest, and they convey an excellent idea of the possibilities of gliding as a competitive sport. There are in addition several diagrams illustrating different types of gliders and showing how a pilot makes use of supporting air currents.

It is rather unfortunate that the book makes no mention of some of the remarkable flights carried out at the Itford, Lewes, meeting held in 1922. At this meeting a flight of 3 hr. 21 min. 7 sec. was made, which still stands as a British duration record. There is also no mention of the world's record for a flight with a passenger, set up at the same meeting.

An iron barque of the seventies. One of the illustrations from "Strange Tales of the Seven Seas" reviewed on next page.

"Strange Tales of the Seven Seas"

By J. G. LOCKHART. (Allan & Company. 8/6)

Here is a collection of true and remarkable sea stories, including some grim tales of mutiny in the merchant service. Black though some of the deeds are, there are by contrast many fine stories of heroism. There is, for example, the story of the steward of the *"Lennie,"* whose conduct during a mutiny has been described as being "as creditable as any in the records of the merchant service." Then, too, we are told of the loyal men of the *"Caswell,"* a handsome iron barque built in 1874, who fought mutineers and brought them back to take their trial at Cork Assizes. In addition to tales such as these, there are stories of modern piracy and such curious episodes as the voyages of the *"Ferret,"* the "crook ship" of the eighties, which "disappeared" time after time to enable its owners to rob the underwriters.

Those who have a taste for adventure, mutiny, and sudden death on the high seas, should certainly enjoy this book.

Warne's "Useful Books"

(Frederick Warne & Co. Ltd. 6d.)

Four new numbers have been added to the interesting series of *"Useful Books"* published by Frederick Warne & Co. Ltd. The new volumes deal respectively with raffia work, leather work, stencilling and the making of soft toys for small children. They are well written and amply illustrated by neat and practical drawings, and they fully maintain the high standard set in the earlier issues.

The volumes dealing with *"Raffia Work and Basketry"* and *"Leather Work and Glove Making"* explain in the simplest possible manner how these branches of handicraft can be mastered with the least trouble and with the best results. Baskets are indispensable in every home, and the chapters dealing with the making of them are as interesting as they are practical. In regard to leather work, the various tools and their uses are described, and full instructions are given for the making of such articles as purses and bags. The volume on *"Stencilling"* deals with a variety of subjects in addition to stencilling proper, such as white wood painting, barbola work, and hand painting on glass. Perhaps the most fascinating volume of all is that on *"Soft Toy Making,"* which deals with the cutting out and stuffing of the soft toys that are so popular with small people.

"The Boys' All-round Book"

(Nelson & Sons Ltd. 5/- net)

Books do not always live up to their titles, but this volume, edited by Walter Wood, more than fulfils expectations. It consists of a collection of good stories and interesting articles. Rear-Admiral Gordon Campbell, V.C., describes his midshipman days, Frank Mitchell writes on cricket, Dr. P. D. B. Spence deals with Rugby football, and Harold M. Abrahams with training for athletic sports. The stories cover a very wide range, and there are seven full-page illustrations and numerous smaller ones.

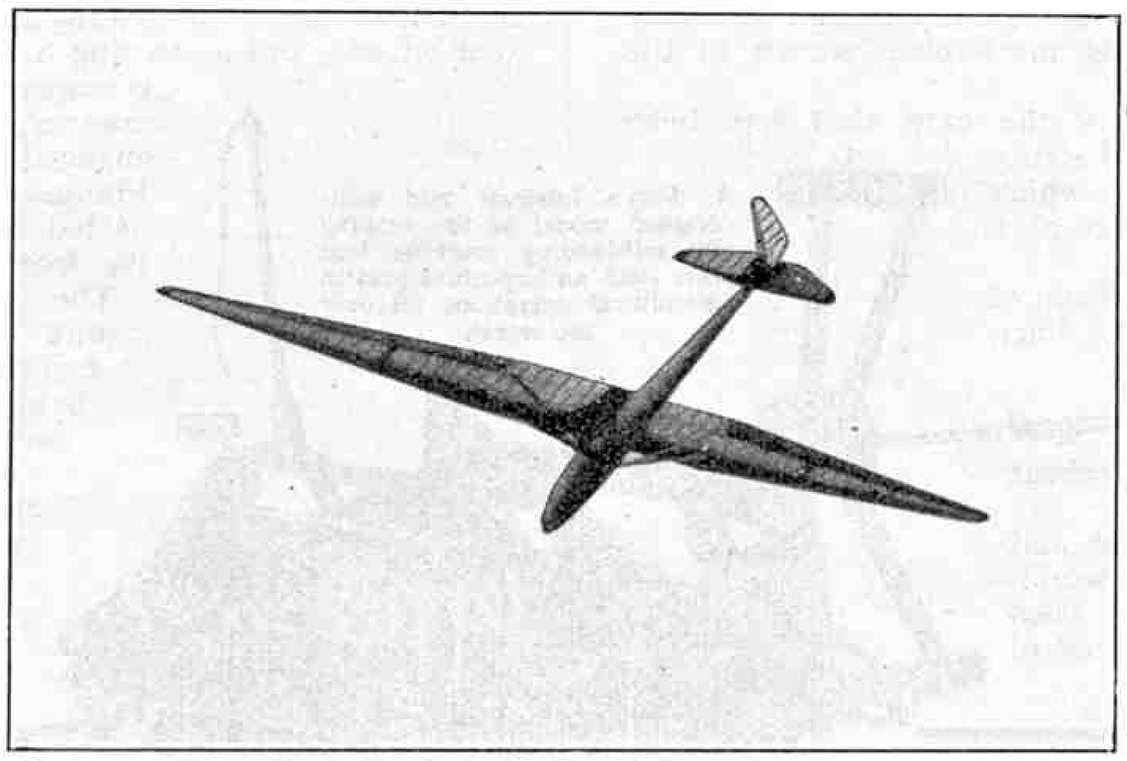
"Handicraft in Plywood"

By W. B. LITTLE. (Pitman & Sons Ltd. 2/6 net)

This is one of the most interesting of Pitman's "Homecraft" series, on account of its very practical nature. Although plywood is widely used to-day, few people have any idea of its possibilities, or how easy it is to use. Carpentry in the ordinary sense of the term presents many difficulties to those who have no special aptitude for the handling of tools, but plywood work, at any rate in its simpler forms, can be undertaken by anyone. Another point is that the tools required for working with plywood are simple and cheap.

After an interesting introductory chapter dealing with the making of plywood and the kinds of timber employed, the author proceeds to describe the most suitable tools for beginners, and to show how work should be commenced. Succeeding chapters deal with such widely different topics as the making of panelling for floors and walls, picture framing, bookcase and wireless cabinet construction, shop fixtures and furniture of various kinds. A special chapter is devoted to decorative work in plywood, and shows a surprising range of possibilities. The making of various articles for school use and the construction of toys and doll's furniture are also dealt with, and a final chapter gives hints for glueing, polishing and staining.

Showing how a glider is catapulted into the air. The launching crew are still running and the tail of the glider has just been released. (See below).



A photograph of a sailplane in flight. From "Gliding and Motorless Flight" reviewed on previous page.

"Stunt Flying"

By Capt. RICHARD DUNCAN
(Crosby, Lockwood & Son. 7/6 net)

A better title for this excellent book would have been "A Complete Manual of Flying Instruction," for it deals not only with the methods of carrying out complicated and advanced air manœuvres, but covers the whole ground of flying training in a concise and practical manner.

The author commences with a chapter devoted largely to the physical qualifications required for a student of flying, and makes it clear that a normally healthy average person will have no difficulty in passing the required tests. From this he passes on to the "Gosport" or "dual control" system of flying instruction that was evolved early in the War at the British School of Flying Instruction at Gosport. In this system the controls in both front and rear cockpit are linked together so that the aeroplane can be flown from either position. This permits the student in his elementary stage to follow every movement of the instructor, feeling the controls gently with hands and feet, but not interfering with their movement. As the student progresses, the instructor hands the controls over to him, checking and correcting his faults as he performs the required evolutions.

After dealing with the normal training course followed for the pilot's first license, the author discusses the work of the test pilot and the problems of exhibition flying. The only chapter on what really may be termed "stunt" flying, dealing with spins, loops, rolls, Immelmann turns, etc., does not appear until nearly half-way through the book. It is followed by a chapter on air speed, and the essential instruments without which it would be impossible to fly an aeroplane with any reasonable degree of safety. Amphibians and flying boats also are dealt with, particular attention being called to the points in which inexperienced pilots would find machines of this type differ in flight from land machines. The book is illustrated with simple but none the less effective line drawings, and its value is greatly increased by the good index.

"Stunt Flying" is a book that should appeal to all "armchair pilots," in addition to those who fly, and a careful study of it would add greatly to the knowledge of flying possessed by most people. The author, an American aviator, is well qualified to write a work of this nature. He received his initial training at Gosport and is now in possession of pilot's and instructor's licenses granted by the Federation Aeronautique Internationale and the licensing authorities of Canada and America. Although the author is naturally most conversant with conditions in America there is surprisingly little in this book that does not hold good for this country. This is the case with the appendix, which contains detailed schedules of instruction courses for licenses which, though dealing specifically with America, are almost equally applicable to British conditions.

Further Comments on the 1930

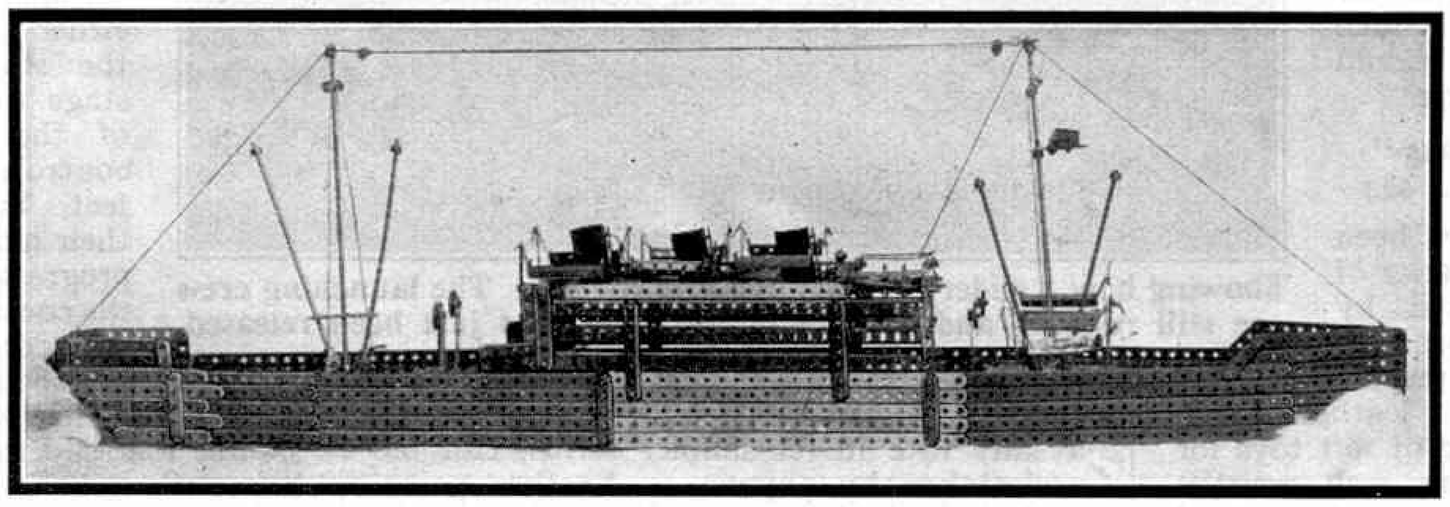
"Autumn" Model-Building Contest

By Frank Hornby

Details of More Prize-winning Models in the Home Sections

LAST month the full list of prize-winners in the "Home" Sections of the "Autumn" Model-building Contest was published, and I gave short descriptions of a few of the prize-winning models. Now that space permits I wish to describe some more of the outstanding entries from the Home Sections. The results in the "Overseas" Section will be published as soon as possible.

The first model to be dealt with this month is a remarkable lifting bridge, constructed by Mr. J. H. Beecroft. The model is illustrated here, and needs no words of mine in support of its claim to one of the major awards in the Contest. The prototype of the model is to be seen at West Bridgeford, where it affords a passage over the Nottingham-Grantham Canal. The bridge is of the cantilever type, and is particularly interesting as it is one of the very few erected in this country, although bridges of the kind are very common on the Continent of Europe. The West Bridgeford bridge has been built quite recently, and it provides an absolutely up-to-date example of this particular branch of the bridge-builder's art. In the actual bridge the roadway is raised and lowered by hand-operated mechanism, but in the model an Electric Motor has been substituted.



The sturdy-looking three-funnelled passenger liner built by W. E. Hunt.

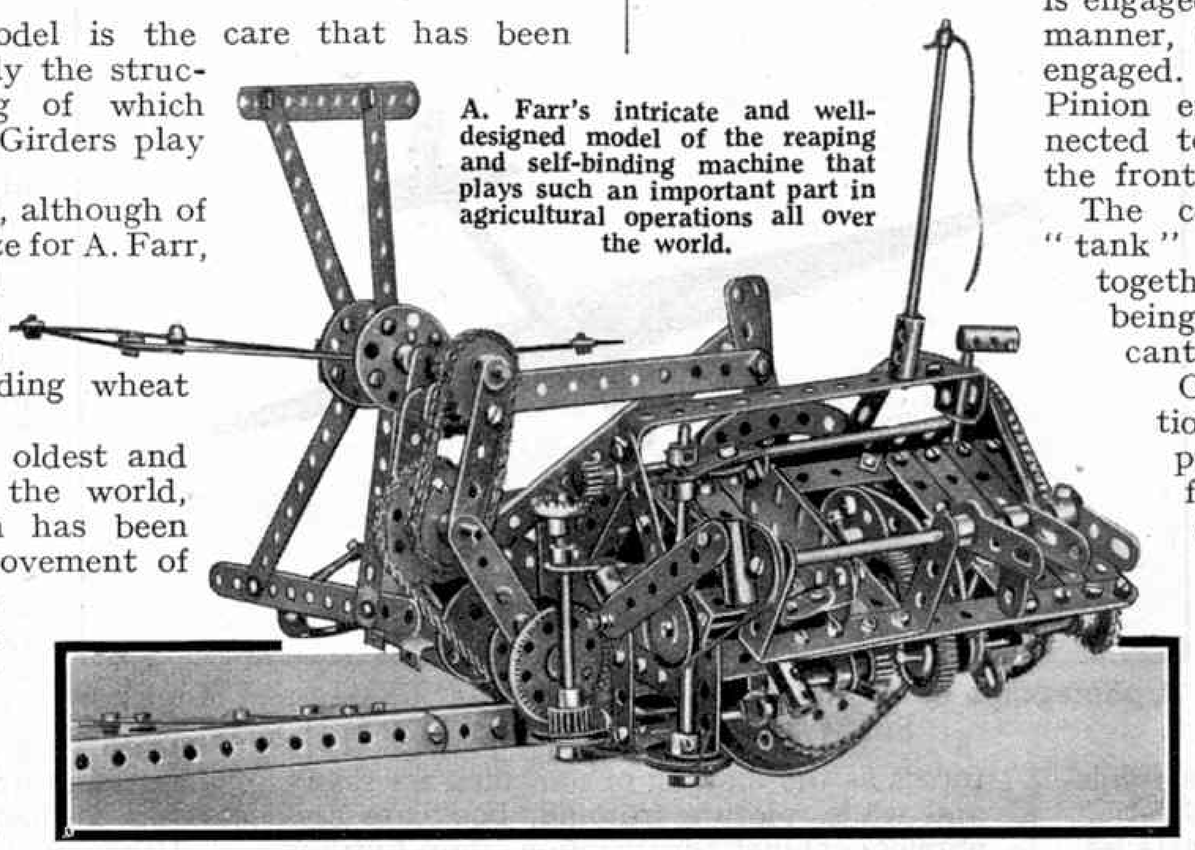
In bridges of this type one of the most important considerations is accurate balancing of the lifting portion, or roadway, and in Mr. Beecroft's model special attention has been given to this point. The roadway is raised and lowered very gradually and smoothly by means of the cord and winding mechanism shown in the illustration.

A good feature of the model is the care that has been taken in reproducing accurately the structural work, in the building of which Plates and Angle and Braced Girders play an important part.

An equally interesting model, although of a quite different type, won a prize for A. Farr, who constructed an agricultural cutting and self-binding machine of a type used largely in this country for cutting and binding wheat into sheafs.

Although agriculture is the oldest and most important industry in the world, comparatively little attention has been paid in the past to the improvement of the implements used, and it is only since about 1850 that automatic mechanical appliances have been in use. Gradually, however, reaping and mowing machines have replaced the time-honoured sickle and scythe for cutting corn and grass, except in confined or hilly places.

The self-binding and cutting machine that forms the prototype of Farr's model is one of the most recent and valuable additions to the agriculturist's implements. The mechanism of such a machine is rather involved and little would be gained from a brief description unaided by illustrations. In operation, however, the machine is most interesting to watch. The corn, as fast as it is cut, falls on to a platform. Here continuously working arms pack the stalks together until there is sufficient to form a sheaf, when the weight of the corn, together with the thrust of the moving arms or "packers," depresses a board which, in turn, throws the binding mechanism into gear. A long curved needle carries string, drawn from a large ball, right round the sheaf, and an ingenious knotting mechanism then seizes both ends of the string and, twisting them into a loop, forms a tight knot. The string is subsequently cut off and the end retained ready for forming the next knot. The finished sheaf is dropped from the platform to the ground by the side of the machine.



A. Farr's intricate and well-designed model of the reaping and self-binding machine that plays such an important part in agricultural operations all over the world.

In the model every effort has been made to reproduce all the movements of an actual machine, and considerable success is attained. The needle, which operates in a very realistic fashion, is represented by a Curved Strip. Farr deserves his success in this contest, for he has attempted a very difficult task in trying to model what is indeed a very intricate machine.

A well-built model of a cesspool emptier drawn by a motor tractor comprised the entry from Eric Campbell. A great deal of patient work has been done in building the model, and the amount of detail incorporated is remarkable. It is based on the latest Rushton industrial tractors, and one of its special features is to be found in the suspension of the front axles by means of semi-elliptic springs, the shackle irons of which are formed from Strip Couplings. The "engine" hood or bonnet is built up from 3" Strips. Other interesting items include a fan driven from the rear wheels, and a starting handle which, when required for use, is engaged by pressing inward in the usual manner, the clutch meanwhile being disengaged. The steering gear consists of a Pinion engaging a Contrate Wheel connected to a Crank that in turn moves the front road wheels.

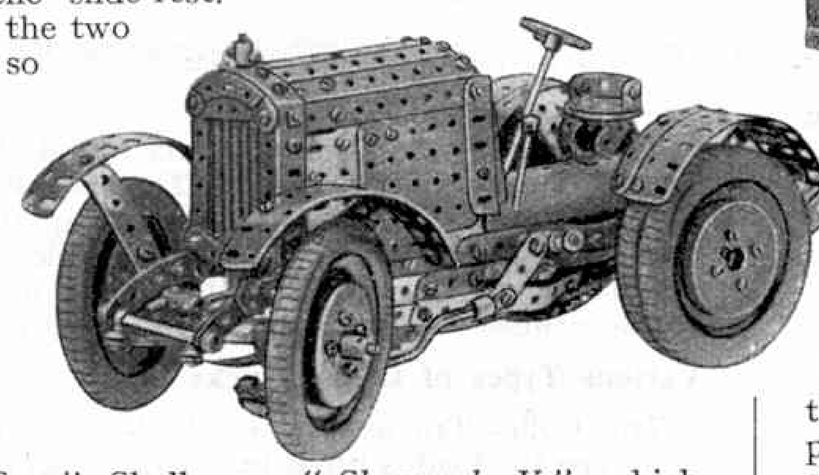
The cesspool emptier consists of a "tank" made from Hub Discs joined together by $12\frac{1}{2}$" Strips, the whole being carried on a trailer fitted with cantilever springs.

One of the accompanying illustrations shows a model of a general-purpose lathe that formed the entry from Ronald J. Mason, who is to be congratulated on his success in reproducing a very difficult subject. Keen Meccano enthusiasts will be quick to note that the lathe tail-stock does not conform to the centre of the head-stock, and a word of explanation is necessary regarding this. Mason informs me that at the time the photograph was taken, he had purposely lowered the tail-stock in order to execute a special facing job. Normally, of course, the tail-stock is raised on Channel Bearings so that its centre conforms to that of the head-stock.

The lathe may be driven from a Meccano Electric Motor, the power from which is transmitted via a cone type pulley, which is built up from one $1\frac{1}{8}$" Flanged Wheel, one $\frac{3}{4}$" Flanged Wheel and a Chimney Adaptor! On the cone-pulley shaft is a 57-teeth Gear that meshes with a $\frac{1}{2}$" Pinion on a shaft that is slidable in its

bearings, and which is operated by a lever. The latter is to be seen in the illustration, just below the head-stock. The sliding shaft carries also a 50-teeth Gear that meshes with a ¾" Pinion on the faceplate shaft, which is in line with the cone-pulley shaft. When the lever is thrown back all gears are thrown out of engagement, and the faceplate ceases to revolve, even though the cone-pulley is still being driven from the power unit.

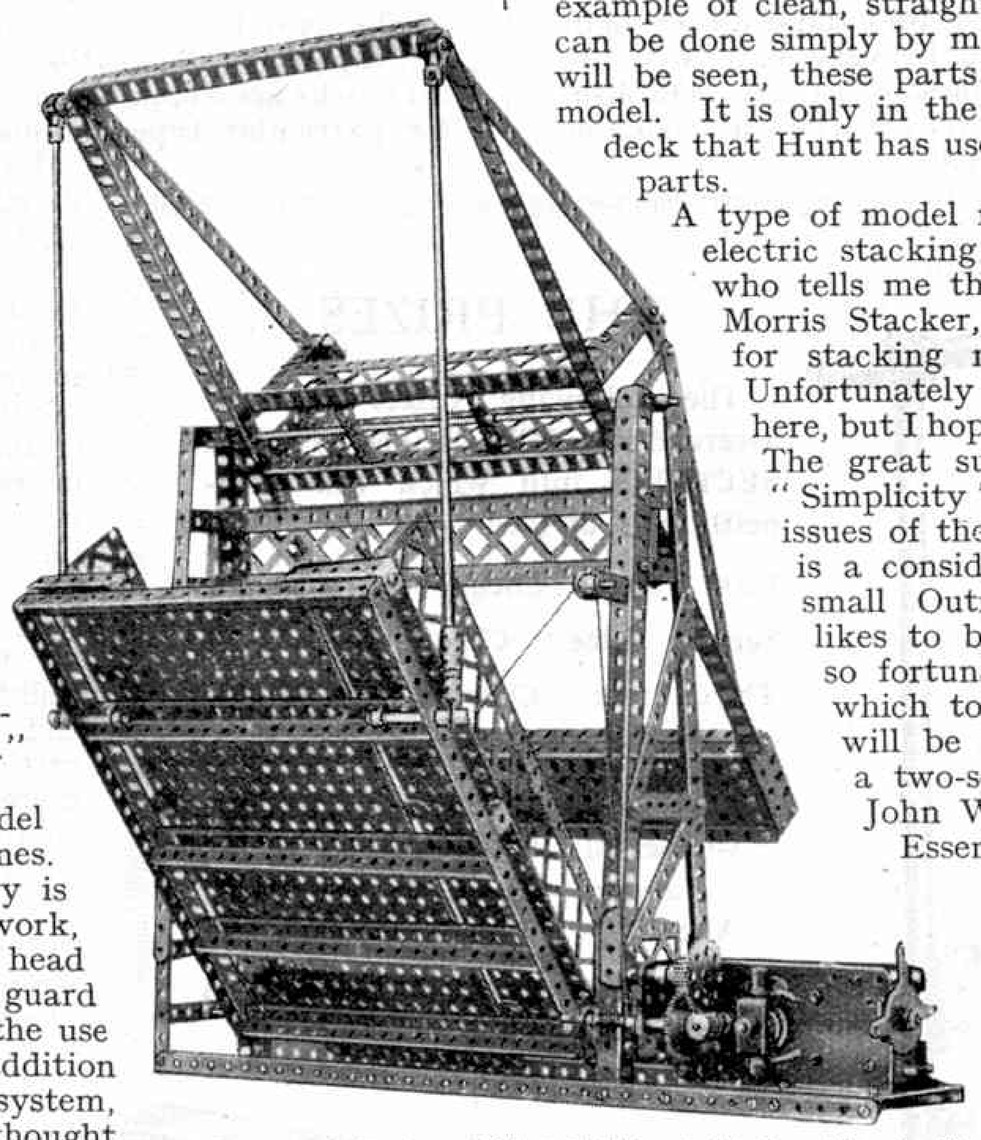
The following is a brief description of the slide-rest feed mechanism. The Chain seen near the head-stock drives a two-piece shaft, one half of which carries a 1" gear that meshes with another 1" Gear on an 11½" Threaded Rod, which in turn engages a Threaded Coupling secured to the slide-rest. A Dog Clutch connects the two halves of the shaft and so forms a self-feed motion, but when the Dog Clutch is disengaged, the drive to the slide-rest is thrown out of gear.



Another really praiseworthy entry from Section A is an interesting scale model of Sir T. Lipton's "Americas Cup" Challenger "*Shamrock V*," which was built by J. E. Warburton. Considerable ingenuity is displayed in forming the graceful lines of the hull from various lengths of Strips, and a really streamlined result is obtained without seriously mutilating any of the parts used. This is by no means an easy task, as experienced model-builders will appreciate. The sails are made of linen. The principal measurements of the vessel are as follows :—Height of the mast, 42 in. ; length of the hull, 31 in. ; beam, 5 in. ; sail area, 471½ sq. in. ; overall height of the yacht from keel to tip of the mast, 53 in.

H. S. Darling submitted a splendid model of a battleship, in which a remarkable wealth of detail combines with good solid construction to produce one of the finest models of this type that it has been my pleasure to see for some time. If space had permitted I should have liked to illustrate the model, for I am sure all "*M.M.*" readers would find it most interesting.

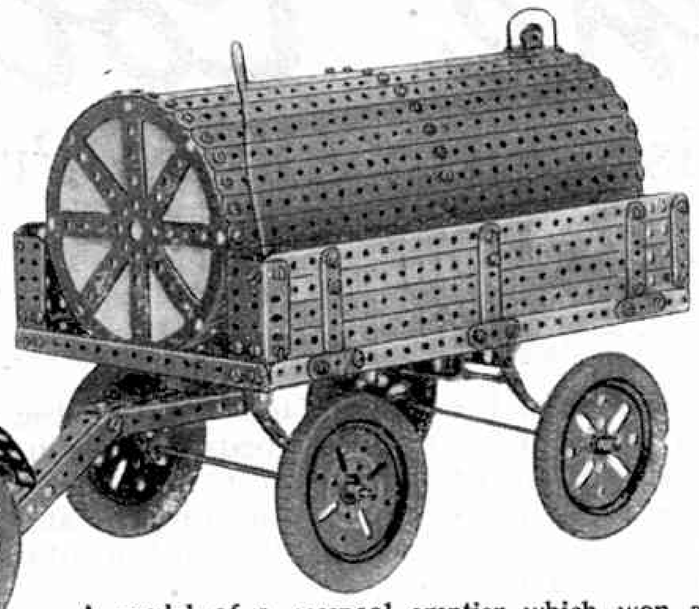
A spacious and sturdy-looking model omnibus brought success to Albert Jones. The outstanding feature of this entry is the careful attention paid to detail work, which includes a hinged windscreen, head and side lamps, ventilators and luggage guard on top of the bus, and handrails for the use of passengers boarding the bus. In addition there is a cleverly-arranged steering system, and the drive transmission is well thought out.



A fine model of a lifting bridge, built by Mr. J. H. Beecroft.

Mr. Thomas Stamford earned the commendation of the competition judges for his skill in building a model of a triple-expansion marine engine, in which part of the cylinders' casing is removed in order to display the working of the valves and pistons. A particularly neat bit of work has been done in making the link-motion valve gear, which is operated from the crankshaft and is controlled from a handle on the rod of which is a Worm engaging the teeth of a Rack Segment. This model should be very useful for demonstrating the principle of link-motion gear.

Probably the finest model in Section B is a ship constructed by John Whittle. I should have liked to illustrate this model also, but unfortunately the print submitted is too indistinct for satisfactory reproduction, and also is of a poor sepia tone. Really good sepia prints, clear and full of detail, reproduce fairly well, but weak prints of this tone are practically useless. It is always preferable to submit black-and-white prints of photographs of models, for these reproduce much better than the best sepia prints.



A model of a cesspool emptier which won a prize for Eric Campbell.

A novel feature of Whittle's model is the deck ventilators, each of which is represented by means of a long Bolt that protrudes upward through the deck and carries a Collar to represent the flare of the ventilator. The roofed-in bridge consists of a Channel Bearing.

Another good entry from Section B is the fine three funnelled passenger liner illustrated here. W. E. Hunt, the builder of this model, is only 13 years of age, and the fact that he is able to produce such excellent work so early in his model-building career affords a splendid testimonial to his skill and painstaking perseverance. While the model does not appear to have any features requiring special comment, the ship as a whole is an excellent example of clean, straightforward construction, and shows what can be done simply by means of Strips, Rods and Plates, for, as will be seen, these parts compose practically the whole of the model. It is only in the detail work of the bridge and the top deck that Hunt has used any of the more specialised Meccano parts.

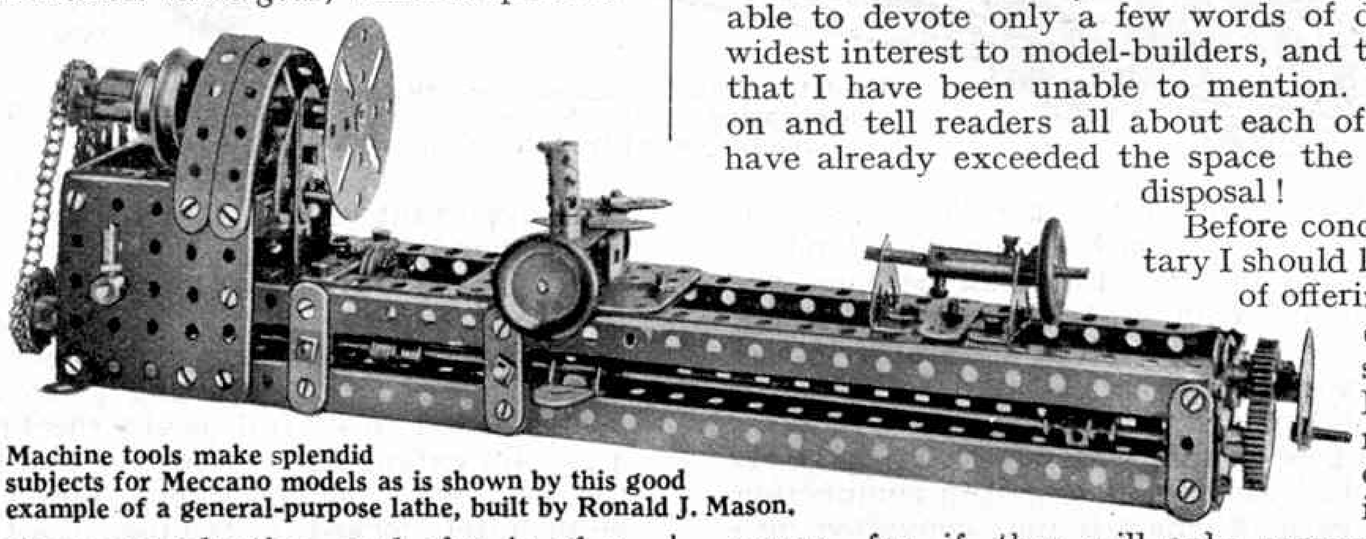
A type of model rarely seen in Meccano Contests is an electric stacking machine entered by J. R. C. Elliott, who tells me that his model is copied from an actual Morris Stacker, in use at the "*Daily Mail*" offices, for stacking newspapers as they leave the press. Unfortunately I am unable to illustrate this model here, but I hope to do so in a future issue of the "*M.M.*"

The great success that has attended each of the "Simplicity" Competitions announced in recent issues of the Magazine makes it evident that there is a considerable demand for models made from small Outfits. Of course, every Meccano boy likes to build big models, but not all boys are so fortunate as to possess the larger sets with which to build them. Readers in this position will be interested in a simple little model of a two-seater motor car that won a prize for John Weldon.

Essentially the entire car is constructed from a few Strips of various lengths, with a Sector Plate for the tonneau and a couple of Angle Girders for the chassis members! With the addition of a few Rods, 2" Pulleys and four Dunlop Tyres, Weldon has worked marvels considering the meagre quantity of parts he has used, and has produced a very realistic and solidly-built model. To do this type of work, using only a limited number of parts, requires considerable model-building skill combined with a thorough knowledge of the uses and applications of those parts used. "Well done Weldon"!

There are so many entries in this contest that I have been able to devote only a few words of description to those of the widest interest to model-builders, and there is still a large number that I have been unable to mention. I wish I had room to go on and tell readers all about each of these, but I am afraid I have already exceeded the space the Editor has placed at my disposal!

Before concluding this brief commentary I should like to take the opportunity of offering a little consolation to all competitors who were not successful in the Contest. I hope that they will not allow their bad luck on this occasion to stand in the way of future successes, for if they will only persevere in their efforts, there is no reason at all why the next contest should not see their names in the list of principal prize-winners!



Machine tools make splendid subjects for Meccano models as is shown by this good example of a general-purpose lathe, built by Ronald J. Mason.

The Collis Truck

British Firm Offers Prizes for Meccano Models

J. Collis & Sons Ltd., of London, are offering splendid cash prizes for the best Meccano models of an ingenious commercial truck that they manufacture for use in engineering works, warehouses, etc., for the rapid transport of goods. These trucks are described fully in the following article, and the details given should enable any Meccano boy to produce an interesting model.

FROM the time that raw material enters a factory up to the moment it leaves in the form of finished goods, it is continually on the move. It is of the greatest importance that the handling operation should be carried out rapidly and easily, otherwise its cost becomes a very serious item in the total cost of producing the finished article.

When large quantities of heavy goods have to be handled it is now usual to employ some kind of mechanical truck, and in this article we describe a very popular vehicle of this type known as the "Collis" Truck. This truck forms an excellent subject for modelling in Meccano, and that is why the makers, J. Collis & Sons Ltd., London, are offering the splendid range of cash prizes listed in the accompanying panel for the best models built by owners of Meccano outfits.

The Collis Trucks have been designed to handle either light or heavy loads as required. They are in very extensive use in food factories, bakeries, dairies, wholesale grocery establishments, etc., and in engineering shops they carry out valuable work in economically moving materials about the factory, from machine shop to assembling, painting, or despatching departments, without any intermediate handling.

In operation the Collis Truck is extremely simple. It corresponds to the chassis of a motor car, and has no body, but only a frame running on ball bearing wheels, and a compact type of elevating mechanism.

The goods to be moved are stacked or stored on wooden platforms fitted with skids or runners, as shown in the accompanying illustrations; and these skids raise the platform from the ground sufficiently high to allow a Collis Truck to be run underneath. The design of these platforms varies according to the materials for which they are to be employed. For small metal or other loose parts, for instance, platforms in the form of a box are used. In other cases the platforms are equipped with racks or with upright standards for holding ringed objects such as tyres; or are fitted with grooved supports for holding huge paper rolls and similar goods.

When it is desired to move a load the Collis Truck is pushed underneath the platform, and the skids of the latter guide the truck centrally under the load. This operation takes only a few seconds. The load and the platform are then lifted clear of the floor simply by pulling the truck handle downward. When the load has been lifted in this manner it can be pulled or pushed anywhere, haulage being extremely easy owing to the fact that ball bearings are fitted to each wheel. When the required destination is reached, the platform is lowered to the ground just as simply as it was raised. The truck is then withdrawn, and is at once available for the transportation of another load.

One of the many advantages of this system of storing goods on platforms is that one Collis Truck may be used in conjunction with 50 or more platforms, each of which is thus converted into a high-grade ball bearing truck. Another advantage is that the truck need not stand idle while a platform is being loaded, for in the meantime it can be employed in moving other platforms previously loaded.

The Collis Truck requires a force of only 38 lb. to start it moving, and 27 lb. to keep it running. Thus it will be seen that the vehicle not only saves labour, but also eliminates heavy work on the part of the truckman, who is thus able to do more useful work per day than would be possible if he had to exert his strength to the utmost hauling goods from place to place.

Various Types of Collis Trucks

The Collis Trucks are available in two main types. In the first type the load is lifted by means of an ingenious and interesting hydraulic mechanism; the second type of truck is purely mechanical in action, the power for lifting the load being obtained from a simple system of levers. The constructional details of the two types differ considerably, as will be seen from the accompanying illustrations. Both the hydraulic and the mechanical trucks are available in several different sizes, designed specially for particular types of load.

Examples of each type of truck are illustrated here. Types B and C belong to the hydraulic class, and types F and R to the mechanical. The F type mechanical truck is designed for handling loads of from 5 cwt. to 10 cwt. It is steered by means of an upright rigid handle placed in front, which can be brought to an inclined position by releasing a catch operated from a convenient point on the handle. This catch is shown in the illustration. The chassis is provided with two central wheels and one wheel at each end, each of the latter being slidable on their axles. The centre wheels are slightly larger in diameter than the two end ones, so that actually the load is carried on the centre wheels. As a result there is a slight amount of rock, and this enables the truck to be pivoted on the centre line of the centre wheels, so that it can be turned completely in a radius equal to half its own length. This is a feature of considerable importance in cases where the truck has to be manœuvred in a confined space.

The load platform is carried on a lifting frame supported by four links, which, as may be seen from the illustration, are pivotally mounted on the front and rear wheel axles. The front end of the lifting frame is provided with a yoke, which engages on a cross member attached to the lower end of the steering handle. When the handle is pulled down, the yoke, and in turn, the lifting frame together with its load, is pulled forward and upward by means of the links pivoting on the wheel axles. It is important to note that the load is lifted by one stroke only of the handle.

In the illustration will be noticed a foot pedal on the side of the truck near the steering handle; and it will be seen that this pedal has a counterweight on the side opposite to the pedal tread, and a cam-shaped projecting piece at the bottom. When the load is lifted to its full height the links become vertical, and to a certain extent are self-held in this position. In order to move the load with perfect safety, however, the lifting frame must be definitely locked in its raised position; and this is done automatically by the foot pedal as its counterweighted end rises and engages a retaining catch suitably placed on the lifting frame. A careful study of the illustration will make it clear how this

THE PRIZES

The following prizes will be awarded in EACH OF THE THREE SECTIONS into which this competition is divided :—

First Prize : Cheque for £3-3s.

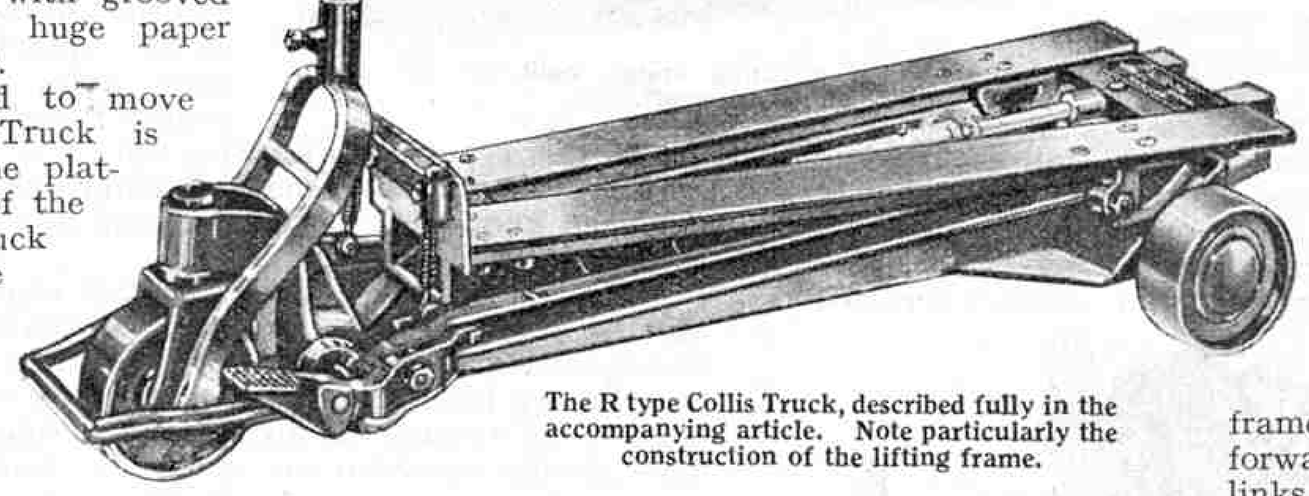
Second Prize : Cheque for £2-2s.

Third Prize : Cheque for £1-1s.

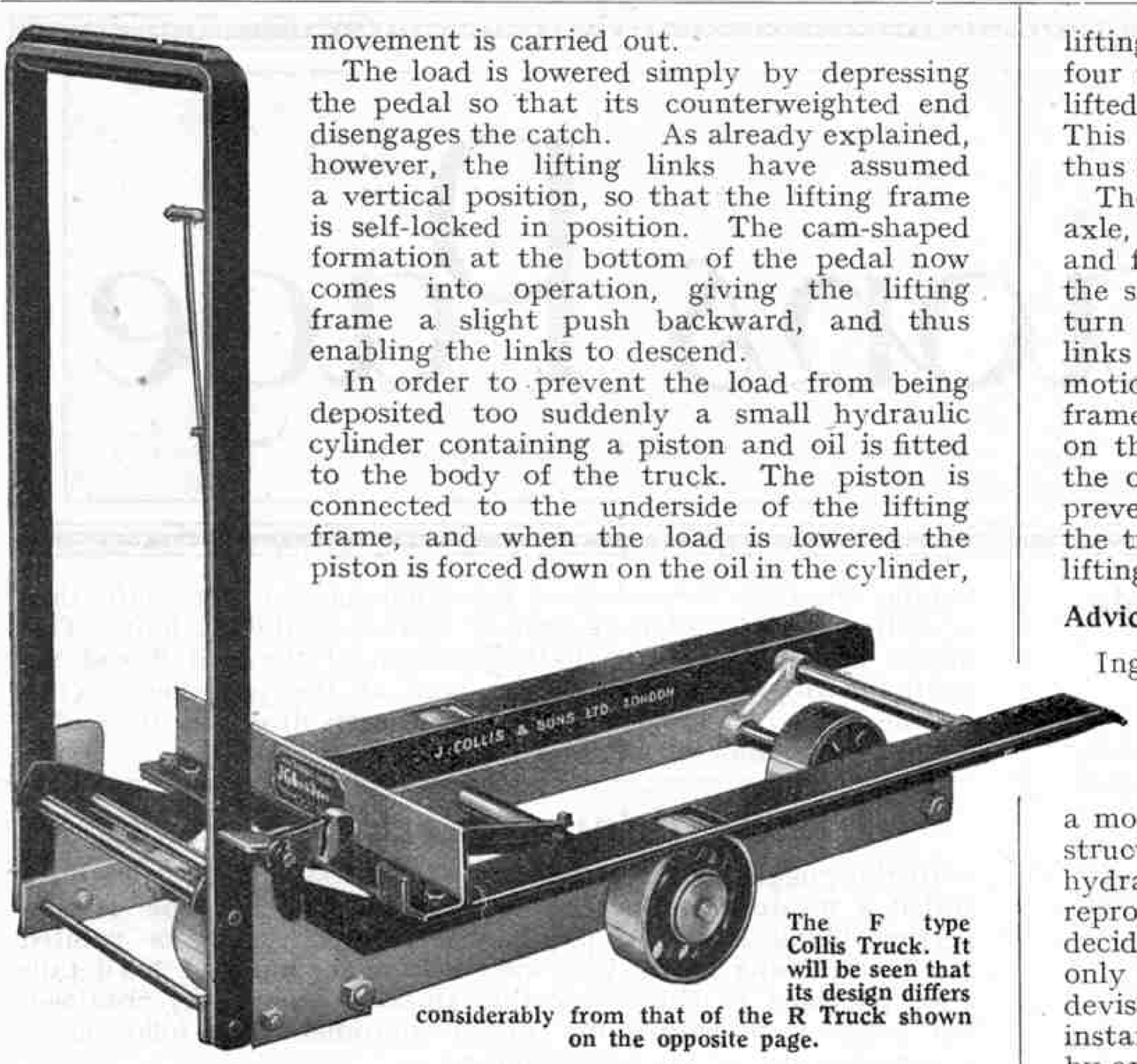
Six Prizes, each of a cheque for 10/6.

Twelve Prizes, consisting of the wonderful book of railways, "*Famous Trains*," by C. J. Allen.

Twelve Prizes, each consisting of a handsome Certificate of Merit.



The R type Collis Truck, described fully in the accompanying article. Note particularly the construction of the lifting frame.



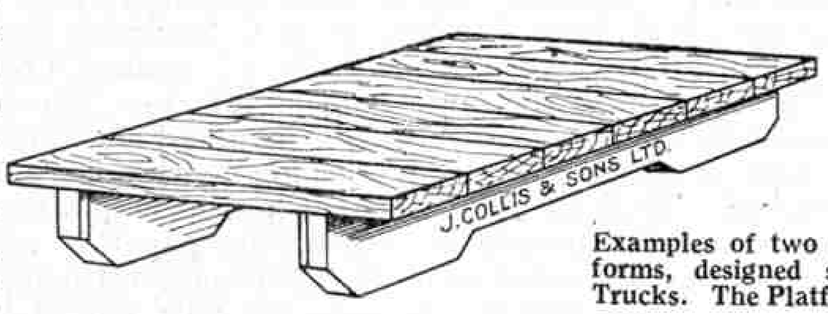
The F type Collis Truck. It will be seen that its design differs considerably from that of the R Truck shown on the opposite page.

movement is carried out.

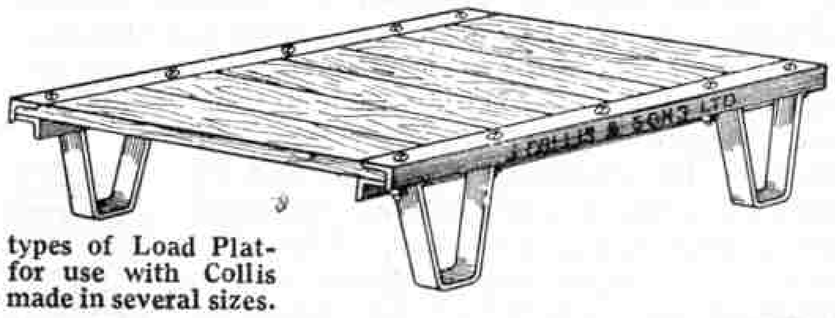
The load is lowered simply by depressing the pedal so that its counterweighted end disengages the catch. As already explained, however, the lifting links have assumed a vertical position, so that the lifting frame is self-locked in position. The cam-shaped formation at the bottom of the pedal now comes into operation, giving the lifting frame a slight push backward, and thus enabling the links to descend.

In order to prevent the load from being deposited too suddenly a small hydraulic cylinder containing a piston and oil is fitted to the body of the truck. The piston is connected to the underside of the lifting frame, and when the load is lowered the piston is forced down on the oil in the cylinder, and the oil is allowed to pass slowly from beneath the piston through a small clack valve in the piston head.

In the R type Collis Truck the lifting frame is in the form of a built-up steel structure and is provided with three inclined surfaces that work corresponding inclined surfaces on the main frame. Lifting the load is effected simply by a single downward stroke of the steering handle, which, in turn, pushes the lifting frame backward and thus causes it to slide up the inclined surfaces on the main frame.



Examples of two different types of Load Platforms, designed specially for use with Collis Trucks. The Platforms are made in several sizes.



The mechanism by which this is brought about is very interesting. A steel forging termed a toggle yoke is anchored at the front end of the main frame. It may be seen in the accompanying illustration forming a kind of ring enclosing the front wheel of the main frame. The yoke is attached pivotally to the frame, and is connected with a knuckle joint attached to two connecting links, the other ends of which are secured pivotally to the rear end of the lifting frame.

When the lifting frame is in its lowered position the toggle yoke assumes an almost vertical position. When the handle is pulled down in order to lift the load, which it does in one stroke, the handle lever pushes down the yoke and in turn pushes the connecting links and the lifting frame backward and upward. At the end of this operation the knuckle joint comes over the centre line between the pivot of the yoke and the back pivoting point of the connecting links, and so becomes self-locked in position.

When it is desired to lower the load the foot pedal is depressed. This has the effect of pushing down the knuckle joint centre, thus allowing the lifting frame to come down under the control of an oil-operated release check, as in the case of F type trucks.

The Collis Hydraulic Truck

The latest and most powerful types of Collis Trucks are operated on the hydraulic principle, oil being used as a working medium. They are capable of lifting and carrying loads ranging from one ton to ten tons. A truck of this type is illustrated here. The load is lifted simply by working the steering handle of the truck in a series of up-and-down strokes. In this case, however, instead of the handle operating a set of levers and links as in the F and R mechanical types, its movement is used to operate a ram working in a small oil-filled cylinder, which may be seen in the illustration, fitted to the front end of the truck.

The ram rod is attached to the front of the lifting frame, which is provided with two pairs of toggle links, coupled by connecting rods to two similar pairs of links at the rear of the frame. The lifting frame is thus furnished with a set of links at each of its four corners. As the ram is forced upward the lifting frame is lifted and the two front pairs of lifting links are opened out. This action causes the connecting rods to be pulled forward, thus opening out the two rear pairs of lifting links.

The two front bottom links are coupled together by the front axle, and the two rear bottom links by the rear axle. Both rear and front axles are square in section, and the links are fitted to the square sections. It will thus be seen that the links cannot turn independently of the axles, and the effect of coupling the links in this manner is that the lifting frame works with a vertical motion with both sides always parallel. If one side of the lifting frame is subjected to more weight than the other, the excess load on that side is transmitted through the links and the axles to the other side. The lifting frame moves in guides in order to prevent any lateral movement in relation to the main frame of the truck, and at the same time to relieve the ram rod and the lifting links of any undue strain.

Advice to Competitors

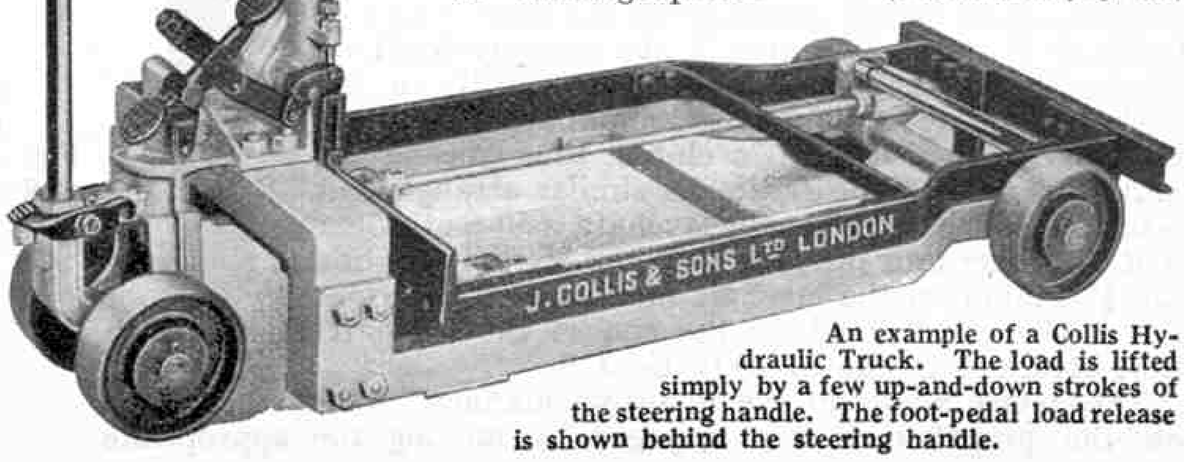
Ingenious Meccano boys should be able to build some very successful models of the Collis Trucks, and we look forward to a very large number of entries. It is not expected that model-builders will be able to reproduce accurately every mechanical detail. The aim should be to build a model to demonstrate clearly the essential features of the construction, such as the bodywork, steering, etc. In the case of the hydraulically-operated trucks it will, of course, be impossible to reproduce the actual hydraulic mechanism. Competitors who decide to reproduce the hydraulic type of truck, therefore, should only follow the construction of the framework, and should then devise some mechanical means of lifting the load platform. For instance, this might be done by means of pulleys and string operated by an up-and-down movement of the steering handle of the truck. There are many other ways in which the lift may be effected, and Meccano boys should have little difficulty in making interesting models. In the case of the F and R type mechanical trucks, competitors should try to reproduce the actual mechanism as faithfully as possible. If they find this too difficult, however, they should not abandon their efforts, but should devise a scheme of their own, whereby the load can be lifted simply by working the truck handle up and down. A well-designed model will have an excellent chance of winning a prize, even though its lifting mechanism differs very considerably from that of the original.

Whichever type of truck may be selected for the model, each competitor must build a suitable load platform for use with it. Two types of Collis platforms are illustrated on this page.

How to Enter the Competition

1. Competitors may build a model of any one of the various types of Collis Trucks illustrated here. No restrictions are laid down as to the quantity of parts that are to be used, and, as every model-builder knows, it is not the number of parts used that will decide the best model.
2. Every model submitted must be the competitor's own unaided work.
3. The age of each competitor will be taken into consideration when deciding the awards.
4. It is only necessary to send either photographs or drawings of models. Actual models will not be accepted. Any points that are not clear in the drawings or photographs should be described briefly on a separate sheet of paper. The photographs and drawings need not be the competitor's own work.
5. Photographs or

(*Continued on page 168*)



An example of a Collis Hydraulic Truck. The load is lifted simply by a few up-and-down strokes of the steering handle. The foot-pedal load release is shown behind the steering handle.

Suggestions Page

(216)—Demonstration Model of Variable Pitch Propeller

(R. Maynard, Luton, Beds.)

The screw propeller for propulsion purposes was first successfully applied by an American named Stevens. He fitted a small boat with a screw operated by a steam engine, and ran it on the Hudson River to the astonishment of the local inhabitants. For many years the screw propeller made no headway in competition with the paddle wheel, but ultimately its immense superiority became realised. To-day, with the exception of a few special-purpose vessels, all ships are driven by screws.

The screw propeller has come into prominence recently in an entirely new sphere, that of the propulsion of aircraft. With an airship or an aeroplane, failure of the propeller is obviously a far more serious matter than is the case with a water-borne vessel; and a great amount of research and experiment has been devoted to the design of air propellers, in order to combine the necessary strength with the required lightness. The amount of work demanded of an aircraft engine varies with the height at which the machine is flying, and in order to maintain a constant engine speed with an ordinary propeller the pilot can adjust the throttle according to the altitude. An alternative to this is to use an airscrew with a variable pitch—that is one in which the angle of the blades can be altered as required. The Hele-Shaw-Beacham variable pitch airscrew, for instance, manufactured by the Gloster Aircraft Co. Ltd., is hydraulically operated and controlled by a centrifugal governor. The pilot sets the governor to the desired engine speed, and it then varies the pitch of the propeller so that whatever the altitude of the machine or the throttle position, the required engine speed is maintained.

Fig. 216 illustrates an interesting demonstration model of a variable pitch propeller. A novel feature of this model is the arrangement by means of which the blades may be angled while they are rotating.

The building of the main containing frame should not prove difficult, as its construction is clearly apparent from the illustration. The propeller blades each consist of a 5½″ Flat Girder, the lower end of which is attached by means of a Coupling to a short Rod. This Rod, to which a ¾″ Pinion is secured, is journalled in the longitudinal bore of a Coupling 10 fixed to the propeller shaft 1, and also in a Flat Trunnion that is bolted to two 3½″ × ½″ Double Angle Strips. The propeller shaft passes through the centre holes of the Double Angle Strips which serve also as bearings for two short Rods, on each of which is a Worm and a ½″ Pinion. The Worms mesh with the ¾″ Pinions on the Rods carrying the blades, and both the ½″ Pinions mesh with a 57-teeth Gear 9, which is loose on the propeller shaft and is connected to a loose 1″ Gear by a Socket Coupling.

A unit comprising a 50-teeth Gear 7 and a Socket Coupling runs loosely on the propeller shaft, and a ¾″ Contrate 6 and a ¾″ Pinion 2 are securely fixed on the shaft. A movement of a lever results in the Socket Coupling coming into contact with the Contrate Wheel, which forms a clutch, thus causing the unit to turn with the shaft. A similar arrangement is followed with regard to the layshaft, a 50-teeth Gear 3 of the latter unit meshing with the ¾″ Pinion, while the ¾″ Pinion on the layshaft meshes with the Gear 7. A 1″ Gear 8 fixed on the end of the layshaft meshes with that attached to the 57-teeth Gear 9.

The device works in the following manner. When the clutch on the propeller shaft is engaged by moving the appropriate handle, the Gear 7 revolves at the same speed as the shaft, thus actuating the ¾″ Pinion and the 1″ Gear 8 on the layshaft. This angles both blades through the medium of the unit 9 and the worm gearing contained in the boss of the propeller. When it is desired to angle the blades in the reverse direction, the clutch is withdrawn and the other is engaged.

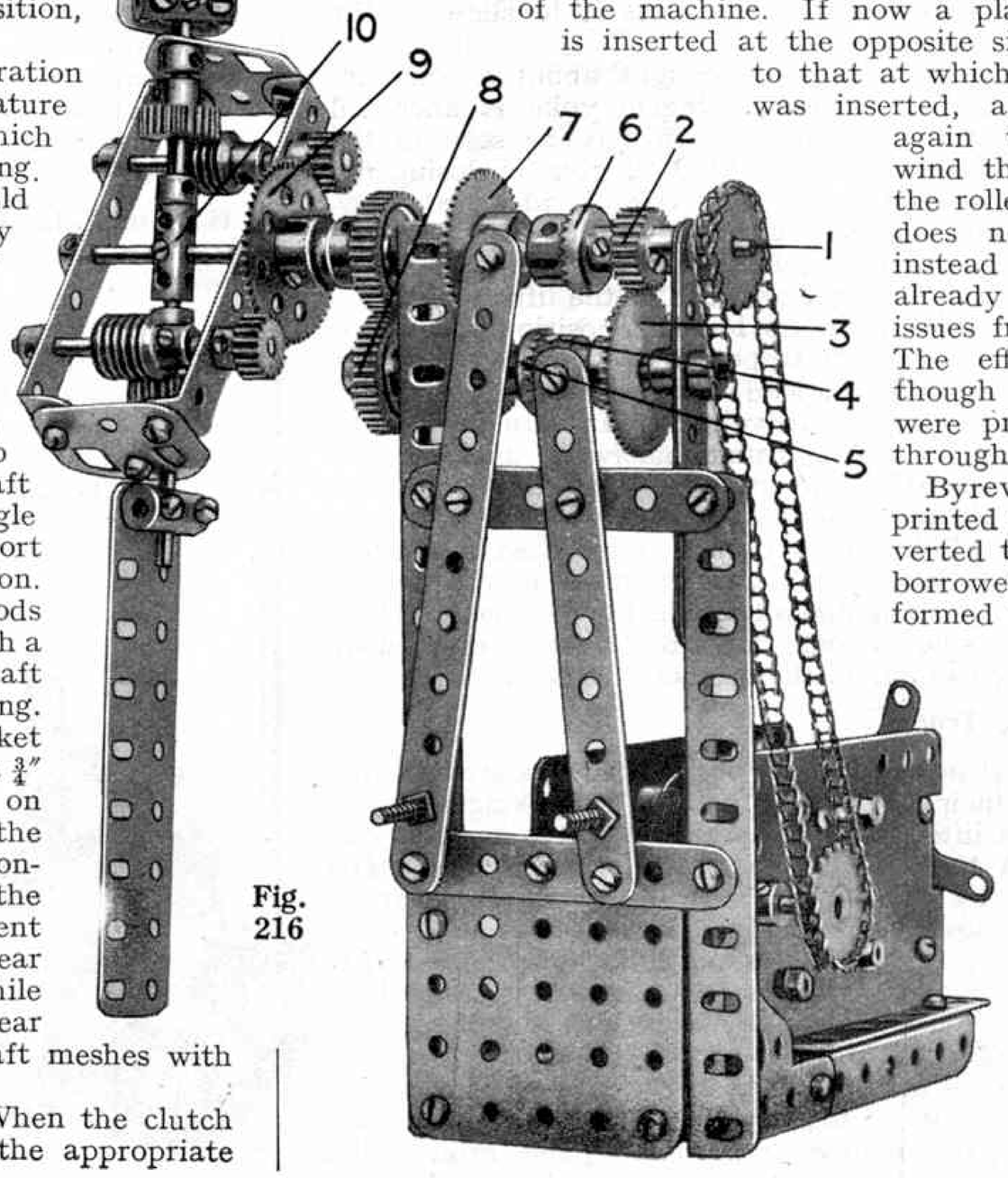


Fig. 216

Mystery Printing Machine Contest

In the Suggestions Section of the May 1930 "*M.M.*" we illustrated a mysterious Meccano Printing Machine, capable of converting blank sheets of paper into printed sheets, or printed sheets into blank sheets, by a mere turn of the handle! No details were provided to show how this amazing result was obtained, but prizes were offered for correct solutions. The following is a complete list of the prize-winners:—

First prize, cheque for 10/6, K. H. Smith, Ross, Hereford. Twelve prizes of Meccano Engineer's Pocket Books—D. J. O'Donoghue, Edinburgh; C. G. Taylor, Norbury, S.W.16; G. D. Grimsdell, Loudwater, Bucks.; L. J. Alcock, Basford, Stoke-on-Trent; S. Carter, Anerley, S.E.20; E. B. Johnson, New Southgate, N.11; F. Lines, Hemel Hempstead, Herts.; D. G. Young, Havant; P. H. Race, Lincoln; R. G. C. Stanesby, London, S.W.18; N. Punf ord, Cricklewood, N.W.2; G. Fenton, Chadwell Heath.

The solution of the mystery is as follows. The device consists essentially of two Wood Rollers mounted one above the other, to each of which the end of a single continuous strip of paper is attached. If a printed piece of paper is placed between the rollers and the handle is turned, the paper is wound into the machine and concealed under the continuous strip of paper covering the rollers. It does not pass out at the other side of the machine. If now a plain piece of paper is inserted at the opposite side of the machine to that at which the printed paper was inserted, and the handle is again turned, so as to wind the plain paper into the rollers, the plain paper does not pass out, but instead the printed paper already in the machine issues from the other side. The effect is exactly as though the blank paper were printed as it passed through the rollers.

By reversing the operation, printed sheets may be converted to plain sheets. A borrowed Bank Note transformed to a plain sheet of paper will cause much fun at the expense of the unfortunate lender! Before displaying the device before an audience it should be loaded with sheets of paper, care being taken to note the side in which they are inserted. Several pieces of paper can be "printed" without revealing the secret.

(217)—A Car Radiator

(I. Cahill, Shoreham-on-Sea)

Model car radiators form the subject of so many suggestions that it might almost be said that they vie in popularity with the model gear boxes that we receive in such surprisingly large numbers. We feel sure, therefore, that the radiator shown in Fig. 217 will prove welcome to those who have long wanted a realistic radiator and have not been able to procure one to suit them.

The main constructional features should be fairly easily seen from the illustration, but one point that requires a little explanation is the method of mounting the radiator tubes. These tubes consist of a number of lengths of Spring Cord, each exactly of the same length, and provided with a loop at each end. The loops are threaded on to two Rods that are slipped over the shanks of $\frac{3}{8}$" Bolts 1. When the Spring Cords are in place their turns should be slightly extended and the lengths spaced equally and closely on the Rods.

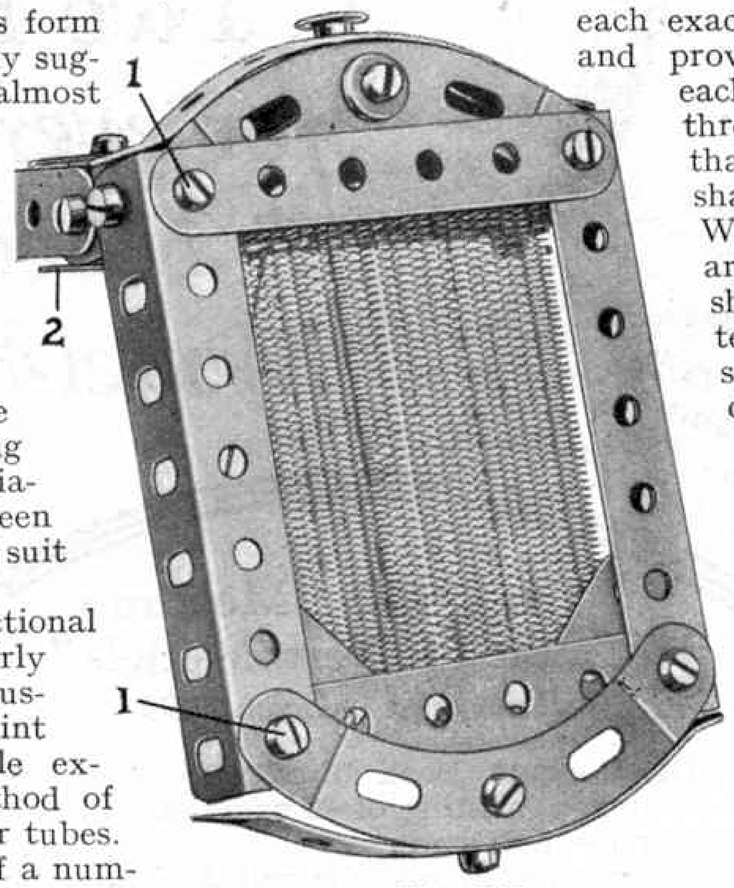


Fig. 217

The water tank 2 consists merely of two 3" Flat Girders that are bolted to Double Brackets at the rear of the radiator; and the sides are filled in by means of a 3" Strip and two 1" by $\frac{1}{2}$" Angle Brackets. The radiator cap is a Buffer Shank and 1" Triangular Plates fill in the bottom corners.

(218)—A Small Electric Switch

In the construction of electrical models, an unobtrusive form of switch is often found desirable. A switch devised by T. Monahan, Leeds, fulfils this need, and is certainly very ingenious. It consists of a Collar that is secured in the required position by a 6 B.A. Bolt. The Bolt shank is insulated from the body of the Collar by two Insulating Bushes that are placed over the ends of the Collar so that the raised lips of the Bushes locate in the hole. The 6 B.A. Bolt is in metallic contact with the framework of the model.

A set-screw, with a Washer on its shank, inserted in one of the grub-screw holes, forms a means of attachment for a wire, and an ordinary bolt working in the other grubscrew hole forms the movable contact piece of the switch. When the bolt is screwed home its tip touches the insulated bolt and thus completes the circuit.

One wire is attached to the Collar as previously explained, and the other wire is connected to the bare metal of the model. It only then remains to connect up the switch with the Accumulator and the apparatus to be operated.

(219)—A Compact Single Plate Clutch

(L. Bolding, Ipswich)

The designing of a clutch that is compact, and at the same time operates in a reliable manner, is by no means an easy task. The difficulty of the problem is clearly shown by the multitude of queries regarding this subject that we receive from readers; and its fascination is evident from the number of suggestions that reach us. An interesting clutch that fulfils the necessary conditions is shown in Fig. 219. It is of the single plate type, and it forms a vivid contrast to the large demonstration model of a similar clutch that appeared in these columns in last month's issue. The model has been modified very slightly, but its essential features have not been changed.

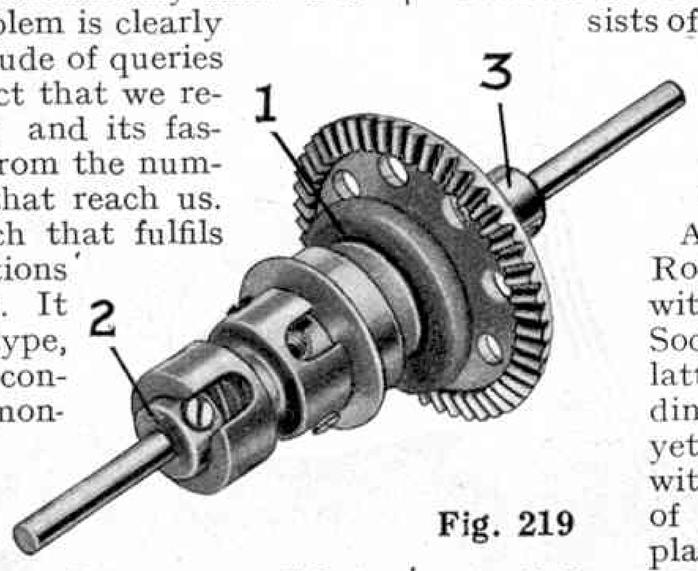


Fig. 219

The clutch consists of three main parts—the driving plate, the floating plate, and the withdrawal plate. The driving plate, a $1\frac{1}{2}$" Bevel that is driven by the prime mover, is loose on the Rod, and the floating plate consists of a $\frac{1}{2}$" loose Pulley shod with a small Rubber Ring. The withdrawal plate is composed of a $\frac{3}{4}$" Flanged Wheel and a Socket Coupling.

A Collar 2 is secured to the Rod, its grub screws engaged with the slot in the end of the Socket Coupling so that the latter is free to slide longitudinally to a limited extent, and yet at the same time to turn with the Rod. A small portion of a Compression Spring is placed on the Rod between the Collar and the Socket Coupling. The driving plate is kept in its position by the Collar 3; the grubscrews of the Collar 2 always engage with the slot of the Socket Coupling.

(No. 220)—A Novel "Slip" Drive

It is sometimes necessary to mount a gear on a rod in order that a light drive may be transmitted, but in such a manner that when excess resistance is encountered, which tends to stop the rod, or when the rod is rotated independently, the gear will continue to revolve. An instance of this is afforded by the necessity of restraining a gear lever pivot from free rotary movement.

A very neat way in which this may be accomplished is as follows:—A $\frac{1}{2}" \times \frac{1}{2}"$ Angle Bracket is bolted to the face of a 57-teeth Gear, which is mounted loosely on a Rod on which is fitted a Spring Clip. The arms of the latter engage with the projecting portion of the Angle Bracket and the drive is transmitted through the Spring Clip to the Rod, thus allowing the Rod to be turned quite easily. This idea may be adapted with great success to clock mechanisms.

Miscellaneous Suggestions

Under this heading "Spanner" replies to readers who submit interesting suggestions regarding new Meccano models or movements that he is unable to deal with more fully elsewhere. On occasion he offers comments and technical criticisms that, he trusts, will be accepted in the same spirit of mutual help in which they are advanced.

(M.103). Automatic Reverse.—An exceedingly simple method of reversing a truck that is propelled by means of a Clockwork Motor is afforded by the suggestion sent in by J. Firth and T. Whitfield (Sudbury Hill, London). One end of a length of cord is attached to one of the road wheel axles, and its other end is tied to the reversing lever of the Motor. When the model is set in motion, the cord is wound on to the axle, thus actuating the reversing lever and reversing the truck.

(M.104). Improvised Universal Coupling.—A means of making an improvised universal coupling has been suggested by a number of readers. The scheme consists of coupling two Rods together by means of a Tension Spring (part No. 43), and it is attached to the ends of the Rods by clamping the lugs of the Spring in the jaws of End Bearings. This form of universal coupling is only suitable for light drives, and in any case the standard part is much to be preferred. The following readers submitted this suggestion:—S. Moore, Forest Hill, S.E.23; E. Hunter, Edinburgh; F. Burrow, Wallington, Surrey; F. Rand, Hawes, Yorks.

(M.105). Making Corrugated Iron.—Corrugated iron to represent the sides and roof of a crane cabin, or any other type of temporary or permanent structure, gives a realistic touch to a model that is hard to obtain in any other way. Many readers, therefore, will be interested to hear of the device suggested by F. Marquand (Woodville, New Zealand). Several Rods, a little longer than the width of the tin sheet it is proposed to use, are mounted in a pair of $12\frac{1}{2}$" Strips, so that the complete device resembles a ladder, the Rods being the rungs. The tin is then passed over and under alternate rungs, thus waving or corrugating it. A good representation of corrugated iron may also be produced by the cardboard that is employed to protect breakable articles in transit.

(M.106). Magnetic Gun.—An interesting magnetic gun is the suggestion of J. Woodward (Birmingham). The gun consists essentially of a Bobbin, wound to capacity with No. 26 S.W.G. wire, and mounted inside a suitable casing that represents a gun barrel. The projectile is a short length of iron wire or a Meccano Rod, which is placed just in the hollow core of the bobbin. When the current that energises the coil is switched on momentarily, the missile is fired a distance of several yards. The current should be switched on and off as quickly as possible.

(M.107). An improvement to Suggestion No. 207.—In connection with the Hints for Storing Parts mentioned in the October, 1930, "Suggestions Section," O. Pfaerdler (Lichtensteig St. Gall, Switzerland) suggests that short screwed Rods be used, instead of wood screws, on which to place the Strips. He points out that nuts could then be run on to the ends of the Rods and thus maintain the Strips in place. Handrail Supports or Collars would form handier nuts than the ordinary nuts.

Such parts as Collars, etc., should be kept in small boxes, appropriately labelled. If the parts are kept in their allotted places, much time will be saved in building models.

1931-2

Two Books for every keen Meccano Model-builder

The 1931 "Meccano Book of New Models"

Ready 1st March, 1931

The 1931 Meccano Book of New Models will be a bumper number, consisting of 40 pages of models and ideas, with an attractive new cover.

As every Meccano boy knows, the principal object of this book is to keep Meccano model-builders in touch with the latest improvements and developments connected with their hobby. The book contains illustrations and details of the best of the new models and new movements submitted in recent competitions, together with many others that have been designed by our own experts. The models shown in this book are of outstanding interest and variety. They range from simple models that can be built with small outfits to elaborate types that will appeal to older boys.

ORDER YOUR COPY TO-DAY

The 1931 Book of New Models may be ordered from any Meccano dealer, price 9d., or direct from Meccano Ltd., Old Swan, Liverpool, price 10½d. post free. (Australian price 1/9 from dealers or 1/11, post free, from our agents. New Zealand and South African prices, 1/– from dealers or 1/2, post free, from our agents. Canadian price, 25 cents from dealers or 30 cents, postpaid, from Meccano Ltd., Toronto). All orders sent direct to us will be dealt with in strict rotation when the book becomes available on 1st March.

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Here is a new Manual that every Meccano model-builder who wants to build better models should have. Its main purpose is to outline the principal uses of the standard parts that together constitute the Meccano System. Detailing every function of every part would be almost impossible, but we believe that by pointing out the special purposes for which the various parts have been designed, together with a few of the other uses that have been suggested from time to time by Meccano boys themselves, we shall help Meccano enthusiasts to build more interesting models, and also to construct them on scientific and practical lines.

HOW TO OBTAIN THE BOOK

We advise every keen Meccano boy to obtain his copy of this new Manual as early as possible. It may be obtained from any Meccano dealer, price 6d., or direct from Meccano Ltd., Old Swan, Liverpool, price 7d. post free. (Overseas price 9d. from dealers, or 10d. post free from our agents. Canadian price, 15 cents from dealers or 20 cents, postpaid, from Meccano Ltd., Toronto.

MECCANO AGENCIES

AUSTRALIA : E. G. Page & Co., 52, Clarence Street, Sydney (P.O. Box 1832K).

NEW ZEALAND : Models Ltd., Kingston Street, Auckland (P.O. Box 129).

CANADA : Meccano Ltd., 34, St. Patrick Street, Toronto.

SOUTH AFRICA : Arthur E. Harris, 142, Market Street, Johannesburg (P.O. Box 1199).

MECCANO LTD.
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No. 00 and No. 4 "Outfits" Contest

Over Eighty Splendid Prizes to be Won

A Splendid Opportunity for Owners of Large or Small Outfits

THIS month we announce the second of the 1931 series of Meccano "Outfits" Model-building Contests. In this contest prizes are offered for the "Best Models Made Entirely from Either a No. 00 Outfit or a No. 4 Outfit." Readers who possess larger outfits may of course enter, provided that they use only parts that are contained in either the No. 00 or the No. 4 Outfits. For the benefit of those who are not familiar with the contents of these outfits we give lists of the parts in each. It is of course not necessary to use all the parts contained in the outfit.

There are no restrictions of any kind in regard to the types of models. Competitors may build any model they like, and the more original the subject the better will be its chance of winning a prize.

Entries will be divided into four Sections, as follows:—Section A, for models built entirely from the parts contained in No. 00 Outfits, by competitors living in the British Isles. Section B, for models built entirely from No. 4 Outfits, by competitors living in the British Isles. Section C, for models built from No. 00 Outfits, by competitors living overseas. Section D, for models built from No. 4 Outfits, by Overseas competitors. Each section is open to readers of all ages. Competitors may submit both a No. 00 Outfit model and No. 4 Outfit model if they wish, but no competitor can win more than one prize in this contest.

Suitable prize-winning models will be illustrated in the *"M.M."*, and also will be included in forthcoming Meccano Manuals of Instruction. This in itself will be regarded by most boys as a sufficient reward for the labour involved. Full lists of prize-winners will be published in the *"M.M."* as soon as possible after the closing dates.

In view of some misapprehension that appears to exist, we take this opportunity of stating that competitors who have been fortunate enough to win prizes in past Meccano competitions are not barred from competing in this or any future contests.

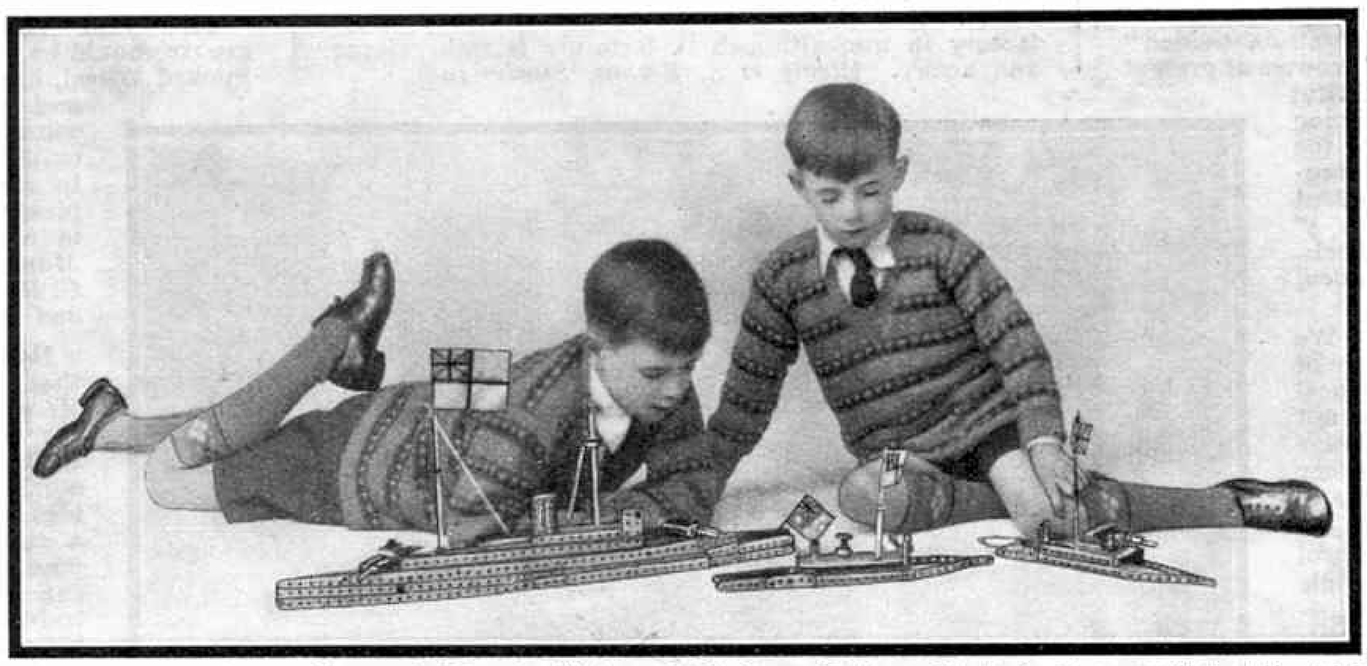
Some readers of the *"M.M."* appear to be deterred from entering Meccano competitions because they think it is necessary to send the actual models. So far from this being the case, we have stated repeatedly that actual models must not be sent in connection with any competition. When a competitor has completed his model he should take as good a photograph of it as possible, or make a careful drawing of it; and submit one or the other, together with any description that may be necessary to make the construction perfectly clear. Boys who do not possess cameras, and who in addition are not good at drawing, need have no hesitation in sending in rough sketches, provided that these are clear enough to enable the judges to form an estimate of the merits of the model.

Each photograph or drawing submitted must bear the competitor's age, name and address on the back, together with the letter A, B, C or D, indicating the Section for which the entry is eligible. Each competitor must enclose with his entry a complete list of the parts required to build the model.

Envelopes containing entries should be addressed: February "Outfits" Contest, Meccano Ltd., Old Swan, Liverpool; and should be marked in the bottom left-hand corner with the appropriate letter indicating the Section.

The closing dates for this competition are as follows:—Home Sections, A and B, 31st March. Overseas Sections, C and D, 30th June. Entries received after these dates will be disqualified.

Photographs or drawings of unsuccessful models will be returned to the senders provided that a stamped addressed envelope of the necessary size is sent with the entry. Prize-winning entries become the property of Meccano Ltd.



The photograph shows Alan and Peter Le Claire, of Worksop, Notts., with their Meccano "fleet," which consists of a cruiser and two torpedo boats. The boys are evidently keen on their hobby, for even the pattern of their jerseys follows the rules of equidistant holes!

The following is a complete list of the parts contained in the No. 00 Outfit:

4 of No. 2; 6 of No. 5; 4 of No. 10; 8 of No. 12; 2 of No. 16; 2 of No. 17; 1 of No. 19s; 4 of No. 22; 1 of No. 24; 4 of No. 35; 1 of No. 36; 16 of No. 37; 4 of No. 37a; 1 of No. 40; 1 of No. 44; 2 of No. 48a; 1 of No. 52; 1 of No. 57; 2 of No. 90a; 4 of No. 111c; 1 of No. 125; 2 of No. 126; 2 of No. 126a.

The parts contained in the No. 4 Outfit are as follows:—

10 of No. 1; 21 of No. 2; 2 of No. 2a; 6 of No. 3; 6 of No. 4; 18 of No. 5; 2 of No. 6a; 9 of No. 8; 4 of No. 9; 9 of No. 10; 5 of No. 11; 22 of No. 12; 6 of No. 12a; 2 of No. 13; 1 of No. 13a; 3 of No. 14; 4 of No. 15; 5 of No. 15a; 5 of No. 16; 5 of No. 17; 4 of No. 18a; 1 of No. 19; 1 of No. 19s; 4 of No. 19b; 4 of No. 20; 4 of No. 20a; 4 of No. 20b; 1 of No. 21; 4 of No. 22; 3 of No. 22a; 3 of No. 23; 1 of No. 23a; 2 of No. 24; 2 of No. 26; 2 of No. 27a; 1 of No. 28; 2 of No. 29; 2 of No. 32; 2 of No. 34; 19 of No. 35; 1 of No. 36; 1 of No. 36b; 126 of No. 37; 6 of No. 37a; 24 of No. 38; 4 of No. 40; 1 of No. 43; 1 of No. 44; 3 of No. 45; 2 of No. 46; 2 of No. 48; 10 of No. 48a; 6 of No. 48b; 2 of No. 48d; 2 of No. 52; 5 of No. 53; 2 of No. 54; 1 of No. 56a; 1 of No. 56; 1 of No. 56c; 1 of No. 57; 10 of No. 59; 2 of No. 62; 6 of No. 63; 1 of No. 65; 2 of No. 77; 1 of No. 80a; 4 of No. 90; 4 of No. 90a; 40" of No. 94; 2 of No. 95; 2 of No. 96; 1 of No. 96a; 1 of No. 98; 4 of No. 99; 6 of No. 100; 2 of No. 103f; 2 of No. 108; 1 of No. 109; 3 of No. 111; 6 of No. 111c; 2 of No. 115; 1 of No. 116; 1 of No. 116a; 4 of No. 125; 4 of No. 126; 4 of No. 126a; 2 of No. 130; 4 of No. 142a; 1 of No. 147a; 1 of No. 147b; 1 of No. 148; 1 of No. 159; 1 of No. 160; 1 of No. 162; 2 of No. 163; 1 of No. 164; 2 of No. 165; 1 of No. 166.

The ample time allowed for construction of models, coupled with the interesting nature of the Contest and the fact that all competitors are limited in their choice of parts, should produce a record number of entries and we trust that Meccano boys will once again live up to their reputation!

Intending competitors should start building right away. They will then have plenty of time in which to complete the models and to add any final details that may be required to improve the finished appearance of the structures. It may be found necessary to redesign certain sections, and there will be ample time for carrying out these alterations, if competitors start work immediately. Delay will probably mean rushing the work in order to be in time for the closing date.

It must be borne in mind that time must be allowed for models to be photographed or drawings prepared, and it is advisable to allow at least a week for this work to be carried out.

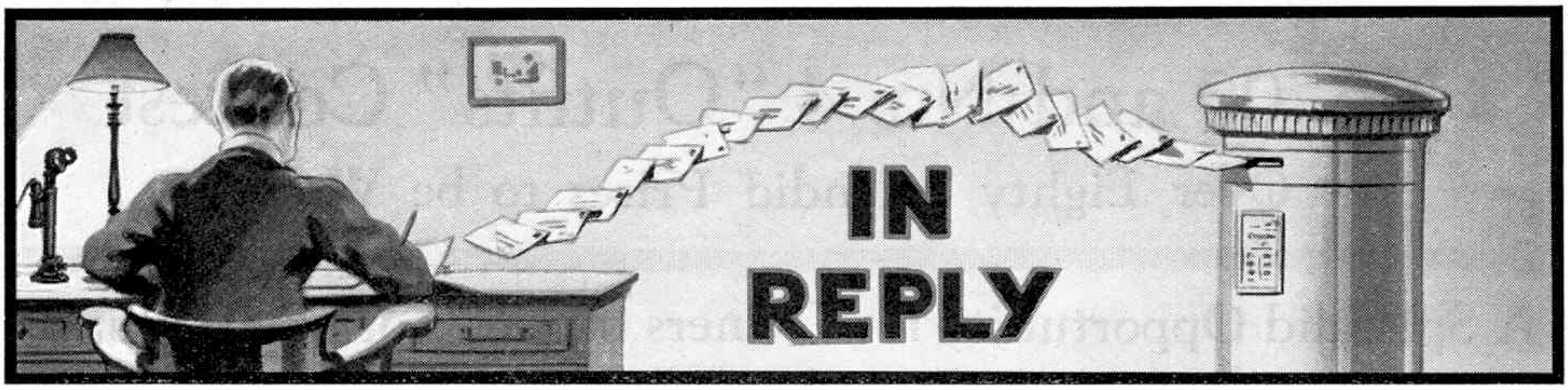
The Prizes

The following Prizes will be awarded in each of the Sections B and D.

First Prize: Cheque for £3-3s.
Second Prize: Cheque for £2-2s.
Third Prize: Cheque for £1-1s.
Six Prizes of Meccano goods, value 10/6.
Six Prizes of Meccano goods, value 5/-.
Twelve Prizes of a Meccano Engineer's Pocket Book.

The following Prizes will be awarded in each of the Sections A and C.

First Prize: Meccano goods, value £2-2s.
Second Prize: Meccano goods, value £1-1s.
Third Prize: Meccano goods, value 10/6.
Six Prizes of Meccano parts to convert a No. 00 Outfit into a No. 1 Outfit.
Six Prizes of a No. 00a Accessory Outfit.
A number of Meccano Certificates of Merit will also be awarded in each Section.



TO READERS' SUGGESTIONS FOR MECCANO IMPROVEMENTS

DOUBLE HOOK.—Your design for a "double hook" which you have submitted is interesting. This hook could be employed in certain types of cranes and it could also be used to represent the anchor of a model ship. The idea appears to possess certain possibilities and we may be able to give it further attention in the near future. (*Reply to A. Oliver, Blackhall*).

REDESIGNED PULLEY.—Your idea that the Meccano Pulleys should incorporate "straight-sided" grooves in place of the "V-shaped" grooves at present employed, would not form a practical improvement, and it would be going against engineering practice to alter the Pulleys in this way. Where a "deep-sided" pulley is required, an excellent one can be formed by clamping a ½" loose Pulley between two Bush Wheels. (*Reply to L. Whitham, Launceston, Tasmania*).

ALTERED FLANGED WHEEL.—We note your suggestion that the flange of the Meccano 1⅛" diam. Flanged Wheel should be increased, but this is not necessary as the existing width of flange will be found adequate in almost every form of constructional work. (*Reply to P. Mython, Groomsport*).

PETROL TANK.—A miniature petrol tank for fitting to a model motor cycle would form a novel addition. The drawback to this part would be its inadaptability and its function would, of course, be purely ornamental. We may be able to give attention to this idea, but we would remind you that a very good representation of a motor cycle petrol tank of the "saddle" type can be built up from standard straight and Curved Strips. (*Reply to L. A. Gurr, Maidstone*).

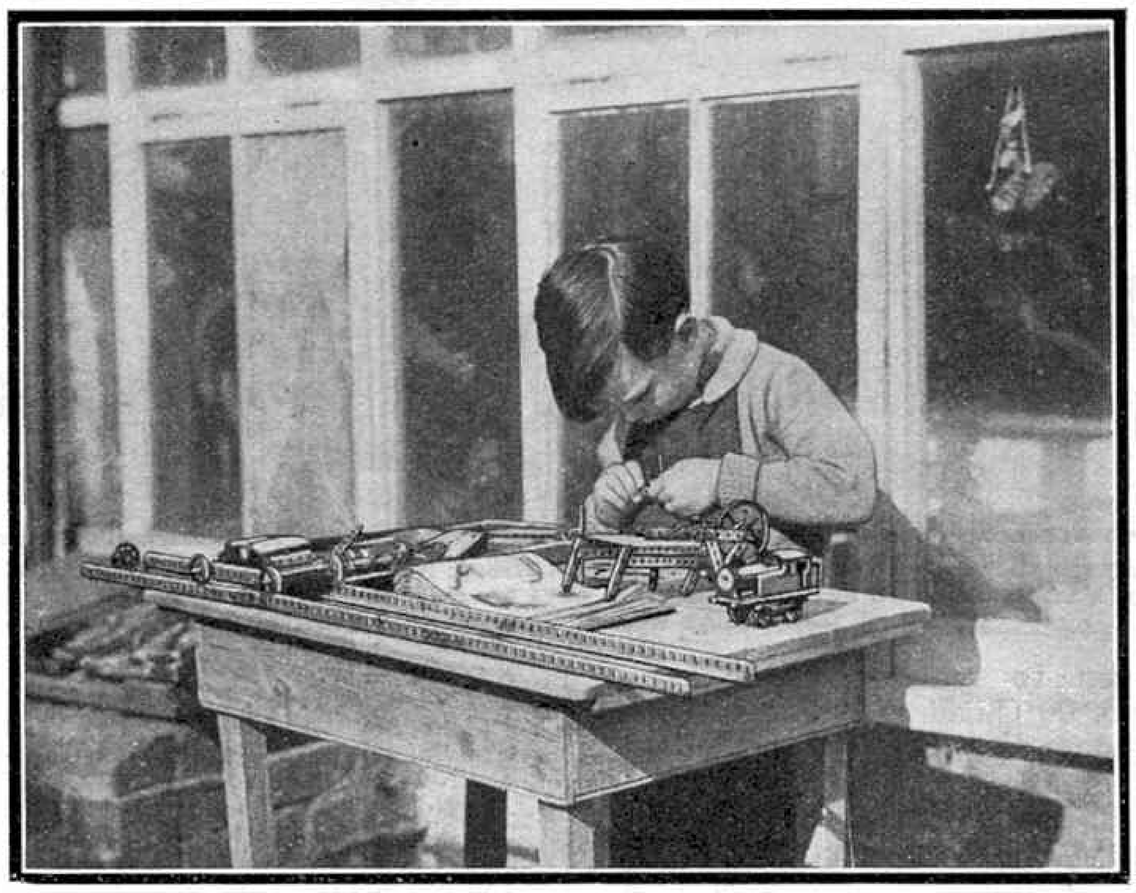
BAND SAW.—An endless tempered steel band having teeth cut in it would enable a very realistic model power-driven band saw to be built up, and the machine could perhaps be put to practical use for cutting cardboard and thin wood. The drawback to the introduction of a saw of this type is that it would be very expensive, but we are going into production costs and may find it possible to introduce the saw in the future. (*Reply to J. P. Lee, Seaford*).

IMPROVED 3½" DIAM. GEAR.—We agree that if a standard size boss were fitted to the 3½" diam. Gear Wheel in place of the large boss at present used, it would be possible to use the Gear with a Socket Coupling. We are looking into this idea, but we must point out that the boss of the part is subjected to considerable torsional stress, and it is for this reason that a large boss is employed. If a smaller boss were fitted, the strength of the part would be lowered to a considerable extent. (*Reply to R. Sutton, Leeds*).

NEW SLEEVE PIECE.—A sleeve piece for use with the 1⅛" Flanged Wheels possesses certain possibilities. The proposed part would form a realistic cylinder for a large size locomotive or it could be employed in the construction of a chimney for a large donkey engine, etc. We may be able to consider the introduction of a part of this type. (*Reply to E. C. Plowman, London, E.8*).

SPECIAL OIL BOTTLE.—Your suggestion that the Meccano Lubricating Oil should be supplied in special "one drop bottles," is interesting, but we are afraid that it would not constitute a practical improvement. The "one drop" effect would be obtained by forming a very small hole in the neck of the bottle so that only one drop at a time was ejected when the bottle was inverted. This type of bottle is doubtless very useful with certain liquids, but it would possess little advantage with lubricating oil, as the lubrication of a Meccano model can only be carried out efficiently with an oil can fitted with a long spout. The Meccano Oil Can No. 1 is excellent for this purpose and costs only 6d., while if a "de luxe" pattern is required, the Meccano "K" type oil can is available at 3/6. (*Reply to E. Whalley, Blackburn*).

SMALL ACCUMULATOR.—If a small 6-volt Accumulator were introduced, it would be possible to incorporate it in many small mobile models, but it would not be economical in use. The Meccano 6-volt Electric Motors consume from 1.5 to 2.5 amperes according to the load placed on them, and this current would impose a severe strain on a small capacity accumulator if taken from it over fairly long periods. For this reason you will find the existing Meccano accumulator (20 ampere hours actual) more satisfactory in use, although it certainly is rather large and heavy. (*Reply to S. Bevans, Sunderland*).



A serious affair, this Meccano engineering! Our photo shows Austin Thomas of Cardiff, who is only five years of age, engaged in constructing a new Meccano model. We feel sure that all "M.M." readers will join with us in wishing this keen young model-builder every success in his hobby.

SPECIAL CAM.—Your idea that a special cam should be introduced is interesting. The proposed part would consist of a small brass collar having a projection formed on one end so that this part would rotate eccentrically on an axle and transmit reciprocating motion to a Rod or Strip. The proposed cam would no doubt function efficiently, but it would be difficult to produce a cam that could be used in a large number of models, as each mechanism requires a different length of movement. We are keeping your idea in mind, however, and we shall make further reference to it in the future. (*Reply to J. Harris, Coventry, and J. R. Murray, Lincoln*).

TEN SHILLINGS FOR A BRIGHT IDEA! Many novel suggestions regarding Meccano parts are forwarded to us, and in order to provide additional interest we are offering a prize of 10/– for the most ingenious idea submitted each month. Each suggestion submitted should be written on a separate sheet, and the name and address of the sender should appear on each sheet used. Envelopes should be addressed to "Suggestions," Meccano Ltd., Binns Road, Old Swan, Liverpool.

The prize of 10/–for the month of December has been awarded to W. Whitaker, Dewsbury, for his idea for a semi-circular plate.

WARSHIP FUNNELS.—We were interested in your suggestion for grey funnels for use on model warships. There appears to be quite a considerable demand amongst model-builders for funnels and other "deck fittings" for models of battleships, etc., and we may be able to consider their introduction soon. (*Reply to R. Wheeler, West Ealing, London*).

PERMANENT MAGNET.—A special "horse-shoe" permanent magnet might be used in the construction of an electric motor and several other electrical mechanisms. This part would be costly to produce however, and we suggest that you use an electro-magnet built from standard parts instead, as this will be both simple and efficient. (*Reply to N. Roberts, Dudley*).

GROOVED WHEEL.—Your suggestion that a groove should be formed in the rim of the 3" diameter Spoked Wheel, has been noted. This is a good idea and it has been under consideration for some time now. Manufacturing difficulties have, however, made it impossible to carry out the alteration up to the present, but we hope to put it into effect in a few month's time. (*Reply to A. Mann, Highfield; H. Masse, Crawley; C. Rice, Liverpool; J. H. Walter, Bristol, and others*).

HOLE IN CRANKSHAFT.—The idea that a hole should be drilled in the Meccano Crankshaft so that the end of the winding cord could be secured rigidly to it when the part was used in a crane, etc., is quite ingenious. Although this idea would solve the problem of making a rigid anchorage, to some extent, it possesses the drawback that the cord can only be attached at one point to the rod whereas it is often required to be secured in different positions. You will be interested to know that we are now experimenting with an ingenious new device, which will effectively overcome all the above difficulties. We hope to make an interesting announcement regarding this in an early issue. (*Reply to C. Willis, Birmingham, and L. Lunn, Barnby*).

QUADRANT PLATE.—Your suggested new flanged plate designed on similar lines to the existing Sector Plate but made in the shape of a quadrant or quarter of a circle, is novel. It would be difficult, however, to find many uses for a part of this type in general model-building. We are nevertheless keeping your idea before us. (*Reply to P. Gardiner, Hornchurch*).

1½" CURVED STRIPS.—Your idea that a curved perforated strip 1½" long should be manufactured has possibilities. As you point out, these strips could be used as the brake shoes of an internal expanding brake, using the standard Wheel Flange as the brake drum. This is certainly a novel application for the suggested strip, but it would be somewhat difficult to find other uses for curved strips having such a small radius. We are nevertheless experimenting with this idea and a further announcement will appear in these pages. (*Reply to C. R. Lloyd, Blackheath*).

TUBULAR GIRDERS.—Your idea that we should manufacture "tubular girders" has possibilities. These parts would resemble long Sleeve Pieces and would be perforated with standard equidistant holes to enable other Meccano parts to be secured to them. There would be a very limited application for these parts in model-building and in addition they would be very difficult to manipulate (imagine securing a nut on the shank of a bolt projecting inside a 5½" length of the girder!). Girders of rectangular section such as the "T," "H," or box pattern can, on the other hand, be built up from standard parts quite easily, and these are far more commonly used in general engineering than the tubular type. (*Reply to V. R. Pickles, Barnsley*).

LARGER DREDGER BUCKET.—A larger edition of the Dredger Bucket might be useful in large models of dredgers, mechanical excavators, etc., two clips and two sets of Sprocket Chain being used to support it. A bucket conveyor built up in this way would, of course, be more expensive than a conveyor composed of the existing Dredger Buckets and a single length of Sprocket Chain, but we are filing your idea for further consideration. (*Reply to A. Hines, Addiscombe*).

IMPROVED FLANGED WHEEL.—We have considered your idea that standard teeth should be cut in the edge of the flange of the Flanged Wheel (see accompanying sketch). The Wheel when manufactured in this way could be used as a 1⅛" Contrate Wheel in addition to its existing function, and its application would thus be extended considerably. Against this must be placed the fact that the cutting of the teeth would entail additional cost in production, and the appearance of the wheel would suffer somewhat. We are interested in the idea, however, and hope to give it further attention. If we decide to adopt the idea, an announcement will appear on this page in a future issue. (*Reply to T. Backhouse, Glasgow, and F. R. Jones, Bath*).

ELECTRO - MAGNET.—A special electro-magnet is an unnecessary addition to the system, as an efficient magnet of this type can be built up from a Meccano Bobbin (part No. 301) wound full of insulated wire, a Meccano Pole Piece (No. 308) being inserted in the centre of the Bobbin to form the "core" of the electro-magnet. When the ends of the insulated wire are connected to the terminals of an accumulator or dry battery, the "core" will be strongly magnetised and Meccano Strips and other steel parts may be lifted. (*Reply to P. Baker, Letchworth*).

NEW BRACKET.—Your idea for a special bracket somewhat resembling two Meccano Architraves placed back to back is novel. We cannot consider introducing a part of this type, however, for although it might be used in structural work to reinforce a joint between a Strip and a Plate or Girder, there are several parts in the Meccano system that can be used for this purpose. A Flat Trunnion or Corner Bracket can be used, or if a larger bracket is required a 3" Triangular Plate can be utilised. (*Reply to L. Houghton, Durham*).

5½" × 5½" FLANGED PLATE.—Your idea that we should introduce a 5½" × 5½" Flanged Plate is interesting. We agree that a plate of this size could be used as the baseplate of a model stationary engine, but the plate would be rather unwieldly and could not be used in small models. We therefore consider that it is a better plan to build up the required size of plate from existing parts. A 5½" × 5½" Flanged Plate can be built up by securing two 5½" × 3½" Flat Plates together and attaching four 5½" Angle Girders around their edges. This form of construction results in a particularly rigid baseplate. (*Repy to J. F. Botham, Colchester*).

1" STRIP.—We are not in favour of your proposal that a 1" strip should be introduced. There are no doubt a few isolated cases where such a strip would be useful, but a Flat Bracket or other standard part will generally serve equally well. Incidentally, a satisfactory "two hole" strip can be improvised by securing two Flat Brackets together so that their slotted holes are at opposite ends. (*Reply to F. J. Tringham, Newcastle*).

NEW STYLE TRUNNION.—It would not be advisable to redesign the standard Meccano Trunnions so as to make them exact replicas of those fitted to the wagons on actual railways, as a considerable loss of adaptability would result. The existing Trunnions were designed primarily for use as journal supports for the axles of model wagons and cars, but they have of course many other functions in general model-building, and these would be impaired considerably if any alteration in design were made. (*Reply to A. B. Swift, St. Annes-on-Sea*).

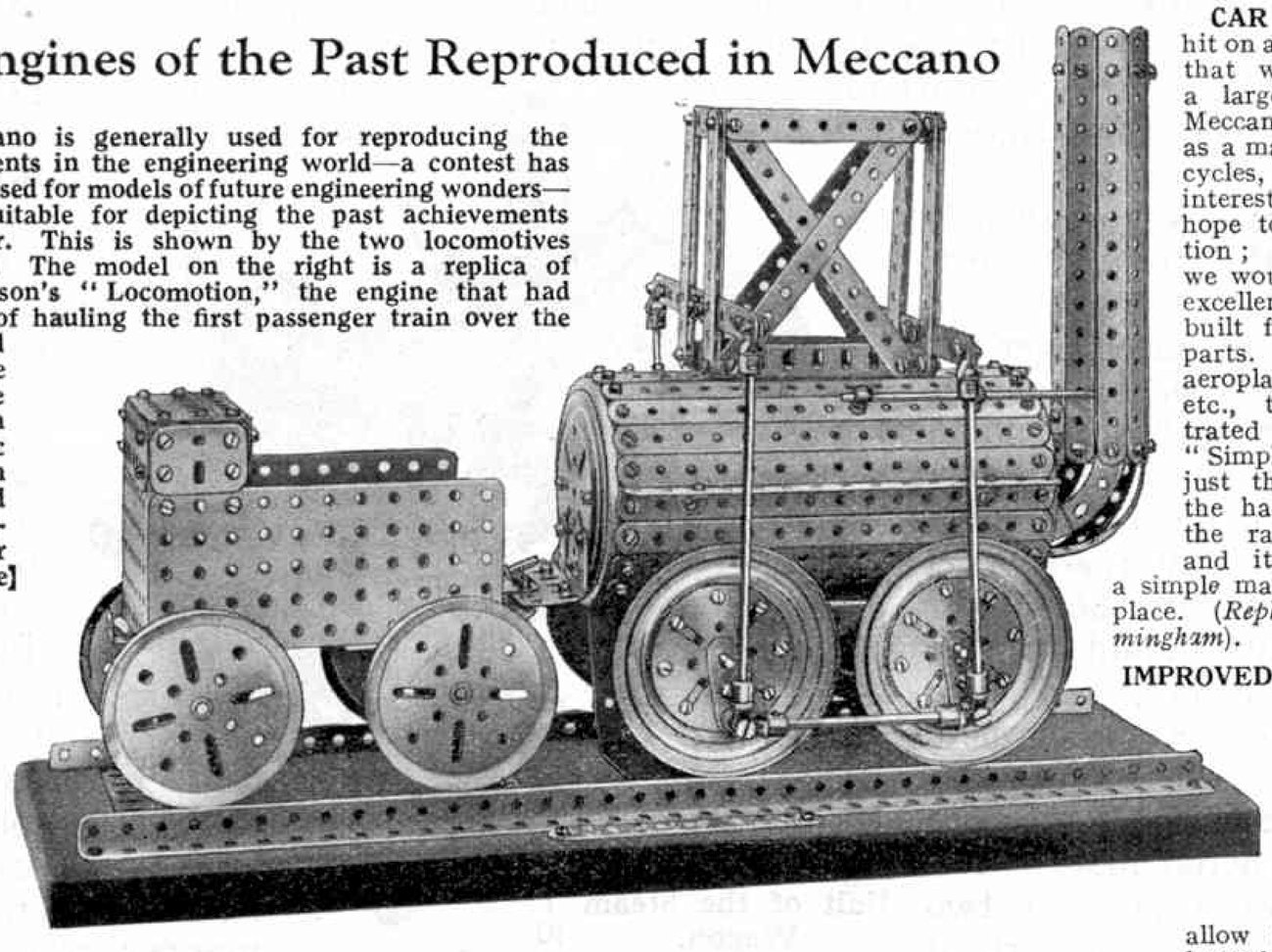
2½" × 1½" FLAT PLATE.—We note your idea that a 2½" × 1½" Flat Plate should be introduced, but we do not consider that this would be a suitable addition as very few uses could be found for a plate of this size. A 2½" × 1½" plate can easily be formed by bolting two 2½" Flat Girders together. (*Reply to R. B. Driscoll, Edinburgh*).

NARROW STRIP.—We cannot consider producing a range of Strips ¼" wide, as this would be going against the principles of the Meccano system. Even if these Strips were cut from relatively thick metal they would be liable to fracture, as the distance between a hole and the edge of a Strip would be very small—less than 1/16". In the few instances where standard Strips are too clumsy we suggest that you use Rods in conjunction with the End Bearings, Strip Couplings, etc., to form the necessary connection. (*Reply to J. R. Potter, Derby*).

1½" SCREWED ROD.—Very few uses could be found for a rod of this length, and in most cases where a 1½" length of Screwed Rod is required a Meccano 2" Screwed Rod can be utilised equally well. Consequently we cannot consider putting your idea into practice. The Meccano threaded Pole Piece, which is 1¾" long, may be used in certain instances in place of the suggested rod. (*Reply to R. Bingham, Hornsey, N.8*).

Famous Engines of the Past Reproduced in Meccano

Although Meccano is generally used for reproducing the latest developments in the engineering world—a contest has even been organised for models of future engineering wonders—it is equally suitable for depicting the past achievements of the engineer. This is shown by the two locomotives illustrated here. The model on the right is a replica of George Stephenson's "Locomotion," the engine that had the distinction of hauling the first passenger train over the Stockton and Darlington line in 1825. The model is driven by an Electric Motor hidden in the boiler, and the quaint overhead valve gear and diminutive]



tender should be noted. Stephenson's other great masterpiece, the "Rocket," has been faithfully reproduced in the model shown on the left. This model will be of particular interest in connection with the Centenary Celebrations of the opening of the Liverpool and Manchester Railway, which took place during September, 1930.

SPOKED GEAR WHEEL.—It would not be advisable to manufacture the 3½" Gear Wheel as a "spoked" wheel by cutting away sections of the metal from the face, as a loss of adaptability and strength would result. You will notice that eight circular perforations and four slots are at present cut in the face of the Gear, and these are of great use for securing various Meccano parts such as Pawls, ends of Strips, etc. If the Wheel were "spoked" as you suggest, the holes and slots would have to be omitted, and the utility of the part would suffer. (*Reply to A. K. Sanders, Folkestone*).

IMPROVED RING FRAME.—Your suggestion that additional holes should be punched in the inner rim of the Ring Frame (part No. 167b) is interesting. The additional holes would enable Strips, etc., to be bolted to the Frame so that they could be used as a flywheel, circular base piece, etc., in very large models. We hope to give this idea careful attention. (*Reply to J. B. Williams, Hove*).

INTERNAL TEETH GEAR.—Your suggestions for an internal teeth gear are interesting. Designs for an annular gear or ring wheel having teeth cut on both its internal and external diameters, have been before our Production Staff for some time now, but it has so far been impossible to produce the part owing to the high cost. It may be possible, however, to produce this gear in the future. (*Reply to E. E. Reed, Gourock, and G. A. V. Ward, Streatham, London*).

SPECIAL STRIPS.—We note your idea that a range of strips should be introduced having threaded perforations in place of the plain holes cut in the standard Strips. We do not consider this addition to be advisable, however, as very few uses could be found for the suggested parts. In certain constructional work it might be possible to economise in Nuts by using these strips in conjunction with standard Bolts, but this would not be as strong as using the orthodox Nuts and Bolts. (*Reply to R. Whitehead, Surbiton*).

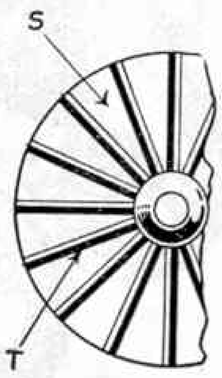
A MODEL-BUILDER'S POCKET KNIFE.—Your idea that we should manufacture a special pocket knife for Meccano model-builders is interesting. The suggested instrument would be fitted with two blades, one of which would have a special "V-groove" cut in it for removing the insulation from covered wire. A screwdriver and winding keys would also be incorporated, and the instrument would prove very useful indeed in all types of model-building. We shall certainly consider this idea. (*Reply to S. C. Jevons, Aberdeen*).

CAR MASCOT.—You have hit on a novel idea in suggesting that we should manufacture a large reproduction of the Meccano Guild Badge for use as a mascot on model-builders' cycles, cars, etc. We are interested in this scheme, and hope to give it careful attention; but at the same time we would remind you that an excellent "mascot" can be built from standard Meccano parts. Many of the tiny model aeroplanes, flying boats, motors, etc., that have been illustrated in connection with the "Simplicity" Contests are just the thing for fitting to the handlebars of a cycle or the radiator cap of a car, and it will be found quite a simple matter to secure them in place. (*Reply to T. R. Rowley, Birmingham*).

IMPROVED BOSS FITTING.—Your suggestion that the bosses fitted to the standard gears should be altered so that the riveted portion would be flush with the face of the wheel is interesting. This alteration would certainly allow two gear wheels to be butted together face to face very closely, but this would be of little advantage in model-building, and the gears can at present be secured within 1/16" of each other. In addition, if the wheels were altered in this way the strength of the connection between the face of the gear and the boss would be lowered, and consequently we do not consider this alteration advisable. You should note that all the latest Meccano Wheels are fitted with a new type triangular boss that is riveted into a similarly shaped hole in the wheel face, and the possibility of the boss rotating independently of the wheel is entirely eliminated. (*Reply to F. Duckworth, Nelson*).

NEW PINION.—Your idea that we should introduce a range of pinions having an ⅛" tooth face is interesting. We agree that these pinions would be slightly more compact than the existing single width pinions, but it is doubtful whether the reduction in width would be of much advantage as the standard ½" boss would still have to be fitted. There undoubtedly would be a number of uses for a range of very compact pinions in gear box construction and we are therefore noting your idea for further attention. We shall be pleased to hear from readers who can suggest a method whereby a very compact pinion might be produced. (*Reply to B. S. Atkins, Cardiff*).

"FACE GEAR."—We have examined your design for a special "face" gear wheel for building right-angle gearing, but we regret to say that this part would be an unsuitable addition as it would not be mechanically sound. The suggested gear would be formed by cutting a series of teeth in the surface of a flat disc of metal and the accompanying sketch (exaggerated to illustrate the point better) will show where the idea fails. The spaces S between the teeth T, it will be seen, vary according to the distance from the centre, and any Meccano gears that were meshed with the wheel would at once jam as the walls of the teeth T are not parallel to each other, and would consequently act as wedges. We are aware that this type of gear is sometimes employed in cheap toy products, but it is bad practice, and certainly is not suitable for inclusion in the Meccano system. (*Reply to W. Burke, Cork, Ireland*).



New Meccano Model

Electrically-operated Steam Road Wagon with Trailer

THE number of steam road vehicles in use on British roads has increased considerably during recent years. This is no doubt due to their ability to transport heavy loads at a cost which, according to statistics, is little more than half the amount required for a petrol lorry.

This month we describe an overtype steam wagon, the term "overtype" meaning that the engine and cylinder unit are mounted over the boiler. The model wagon consists of three distinct units—the main frame, carrying the bodywork; the boiler and engine unit, which also includes the front road wheel assembly; and lastly the power unit. These units should each be constructed separately, and then assembled to form the complete model.

The main frame and bodywork should be constructed first. The frame consists essentially of two Girders 1 (Fig. 2), each formed from two 12½" Angle Girders overlapped 18 holes and bolted together. These girders are spaced apart by 5½" transverse Girders, to the ends of which are bolted 12½" Girders forming the sides of the platform. Two 12½" Flat Girders 2, secured by means of Angle Brackets to the front ends of the Girders 1, carry 1"×1" Angle Brackets, to which 1½" Strips are bolted as shown. A Channel Bearing is also secured to the right hand composite Girder, as can be seen in Fig. 6.

The boiler unit (Fig. 1) is held in position between two Girders 1 by two 3½" Rods 2 that are passed through holes in the Girders, 5½" Strips being bolted to the latter to cover the elongated holes. A Sleeve Piece is mounted on the boiler to represent the steam cylinder, on the inside of which an Angle Bracket is secured to hold a short Rod 4, forming the piston connecting rod. A small Fork Piece is secured to the end of the Rod, and its forked end is slipped on to the 3" Rod 5, which represents the crankshaft. This latter Rod is journalled in a Double Bracket secured to the Boiler, and also in a Flat Bracket 7 (Fig. 2) that is bolted to the Channel Bearing on the frame (see Fig. 6). Two 2" Pulleys serve as a flywheel, while a 1" Pulley also mounted on the crankshaft is connected to a similar Pulley secured to the armature of the Electric Motor by a crossed belt composed of Meccano Cord. This arrangement enables the crankshaft to be rotated in a realistic manner when the complete model is set in motion.

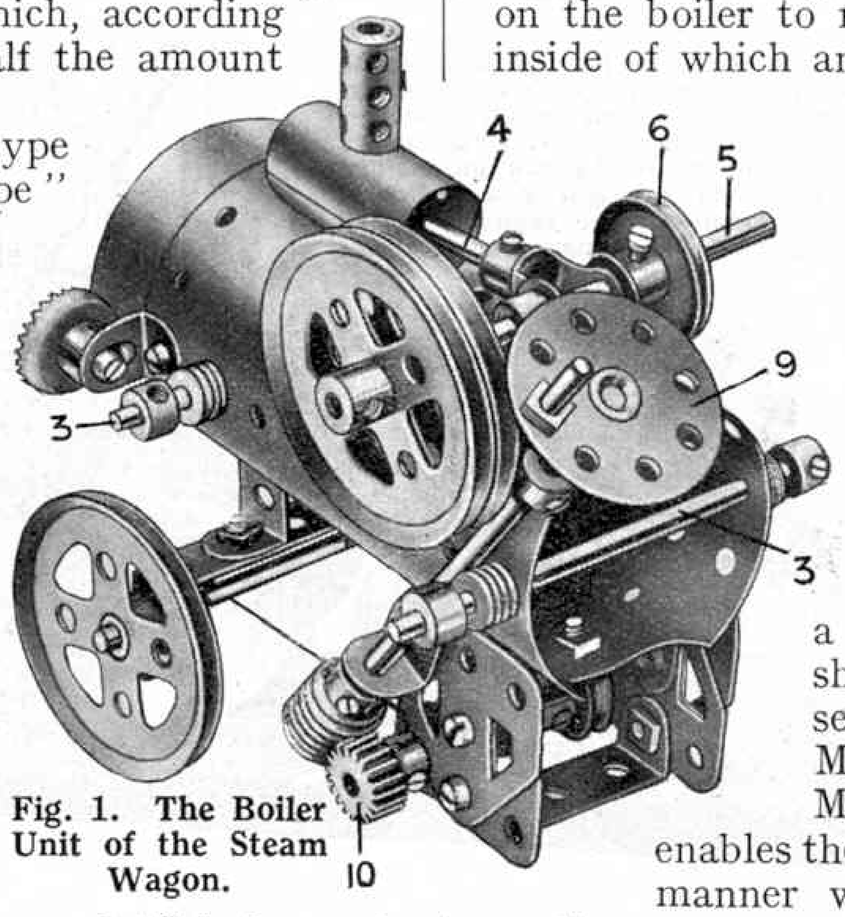


Fig. 1. The Boiler Unit of the Steam Wagon.

A Chimney Adaptor is pushed into the end of the Sleeve Piece forming the steam cylinder, and the Adaptor is secured to the base of the chimney by an Angle Bracket. The chimney itself consists of three 3½" Strips held together at the base by a Double Bracket. The upper portion is secured to the roof of the cab and surmounted by a ¾" Flanged Wheel, which is mounted on a short Rod carrying a Collar. The latter is held in place by a bolt passed through a hole in the 3½" Strip forming the front of the chimney.

The "firebox" is formed by two pairs of Flat Trunnions held together by 1½"×1½" Double Angle Strips, one of which is secured to the boiler. The frame so formed supports the steering mechanism, which is operated by the hand wheel 9. The hand wheel is mounted on the upper end of a 4" Axle Rod that is journalled in an Angle Bracket secured to the firebox and also in a Flat Bracket bolted to a ½" Reversed Angle Bracket, which in turn is secured to the left-hand composite Girder 1, as can be seen in Fig. 2. The lower end of the Rod carries a Worm, which engages with a ½" Pinion 10. This Pinion is secured on the end of a 2" Rod carrying a Coupling

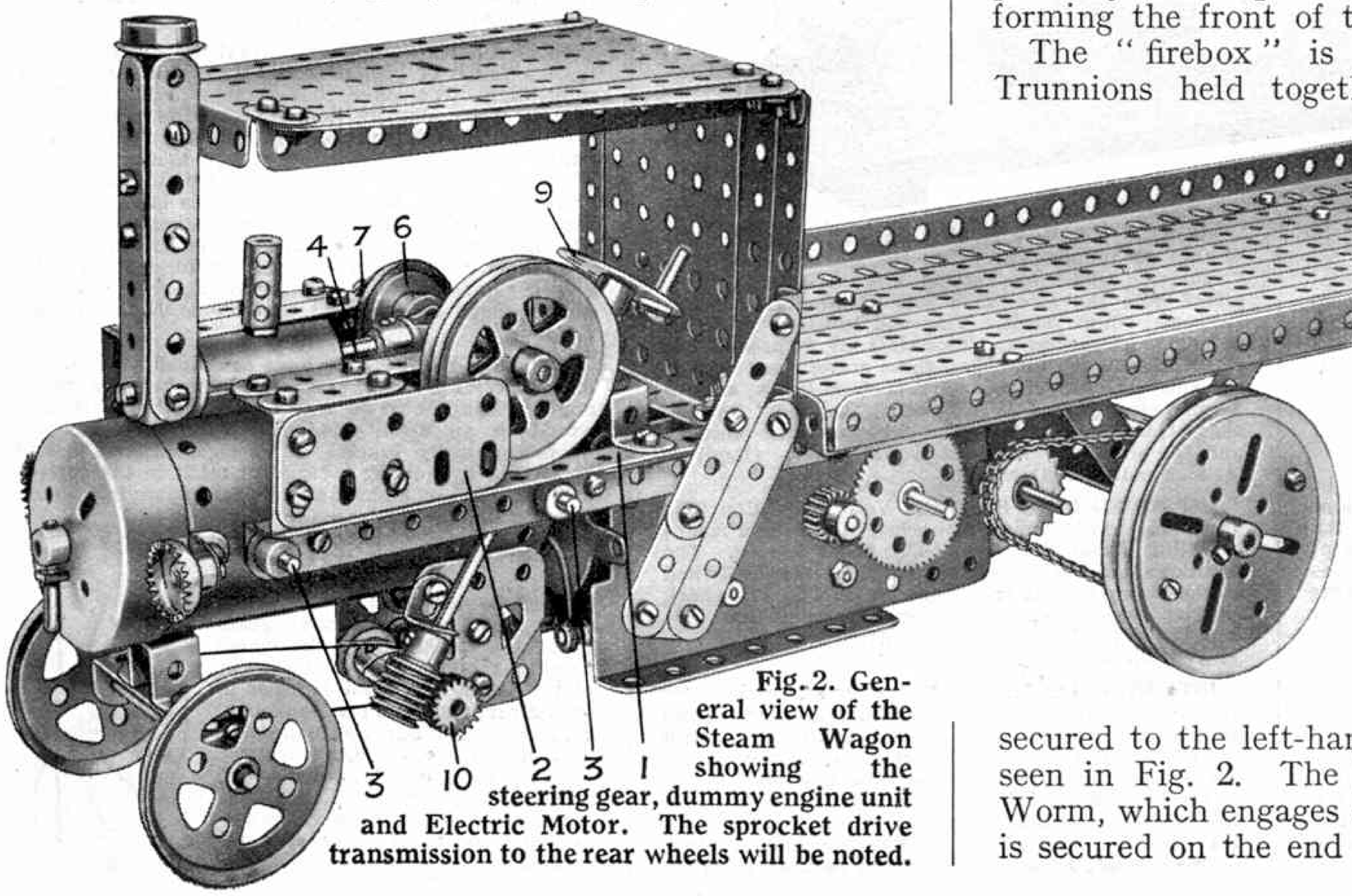


Fig. 2. General view of the Steam Wagon showing the steering gear, dummy engine unit and Electric Motor. The sprocket drive transmission to the rear wheels will be noted.

between two ½″ loose Pulleys, and a length of cord wound round the Coupling has its ends secured to the Double Angle Strip carrying the front axle. The Double Angle Strip is bolted to a Double Bent Strip, which is pivoted by a bolt and two nuts to the underside of the Boiler (see Fig. 1).

A 6-volt Electric Motor is suspended beneath the frame of the model to represent the water tank, and supplies the drive to the rear axle. The arrangement of the gearing is shown in Fig. 5. A ½″ Pinion on the Motor armature spindle meshes with a 57-teeth Gear on a Rod that carries a further Pinion engaging with a second 57-teeth Gear on a second Rod. The latter Rod carries two 1″ Sprockets, from which the drive is led by means of endless lengths of Sprocket Chain to 2″ Sprockets on the Rod carrying the rear road wheels. Each of these wheels consists of two 3″ Pulleys butted together face to face. As previously mentioned, the armature shaft of the Motor carries a 1″ fast Pulley for transmitting motion to the crankshaft. The endless cord, after passing round the Pulley 6, is crossed, passed on either side of the ½″ loose Pulley 8 (Fig. 5), and again crossed before being led round the Pulley on the Motor spindle. The Motor is held in position by the Angle Brackets 12.

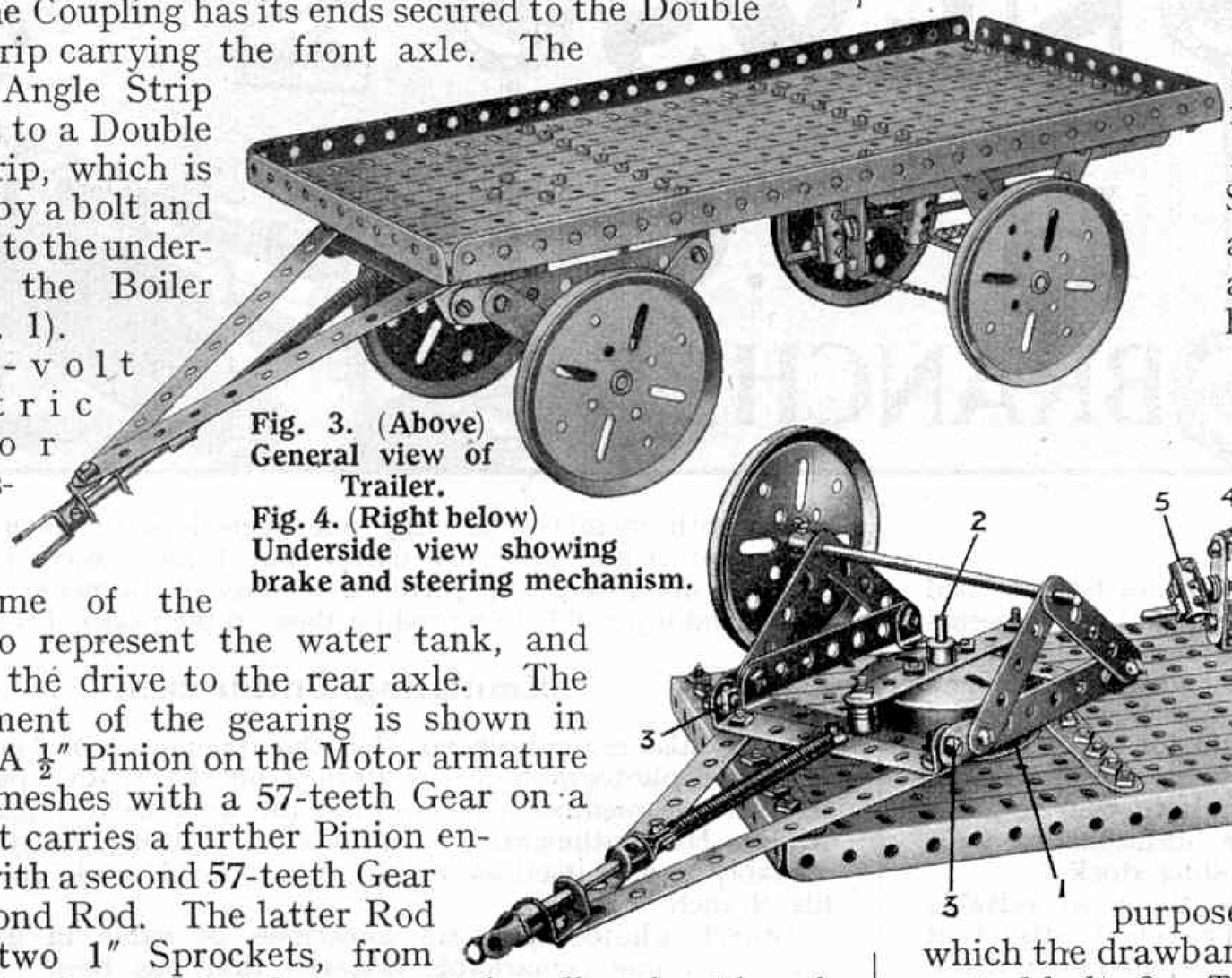
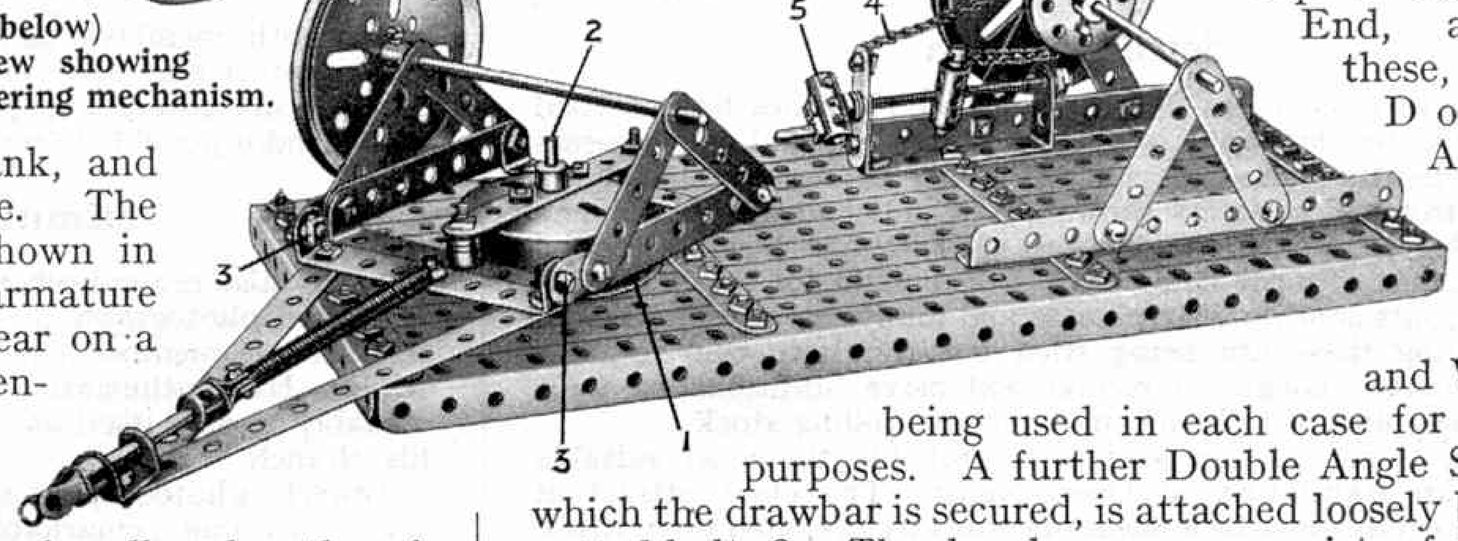


Fig. 3. (Above) General view of Trailer.

Fig. 4. (Right below) Underside view showing brake and steering mechanism.



The switch arm of the Motor is extended by means of a short Rod held in a Coupling, to facilitate control from the cab. This Coupling is secured by two bolts passed through the holes in the switch arm and screwed into the tapped holes of the Coupling. Each of the bolts carries a nut for spacing purposes.

After the three main units have been constructed, they may be assembled in their respective positions, thus completing the model wagon.

A double length of rubber-covered wire is used for connecting the Accumulator to the Motor, and it will be noted from Fig. 6 that the wires in the model have been coiled to give the effect of a miniature hose. The coil should be tied to the side girder of the wagon and to the flange of the Electric Motor, so that the wire can be passed through the platform to the Accumulator. The Steam Wagon possesses considerable power, and will haul a load of 18 lb. in addition to the Accumulator.

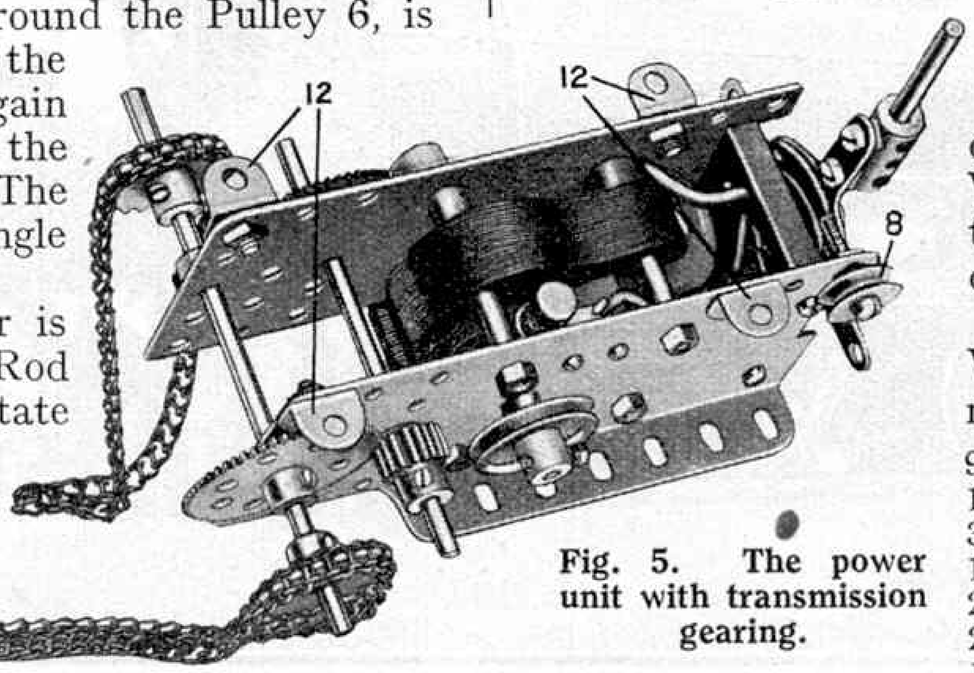


Fig. 5. The power unit with transmission gearing.

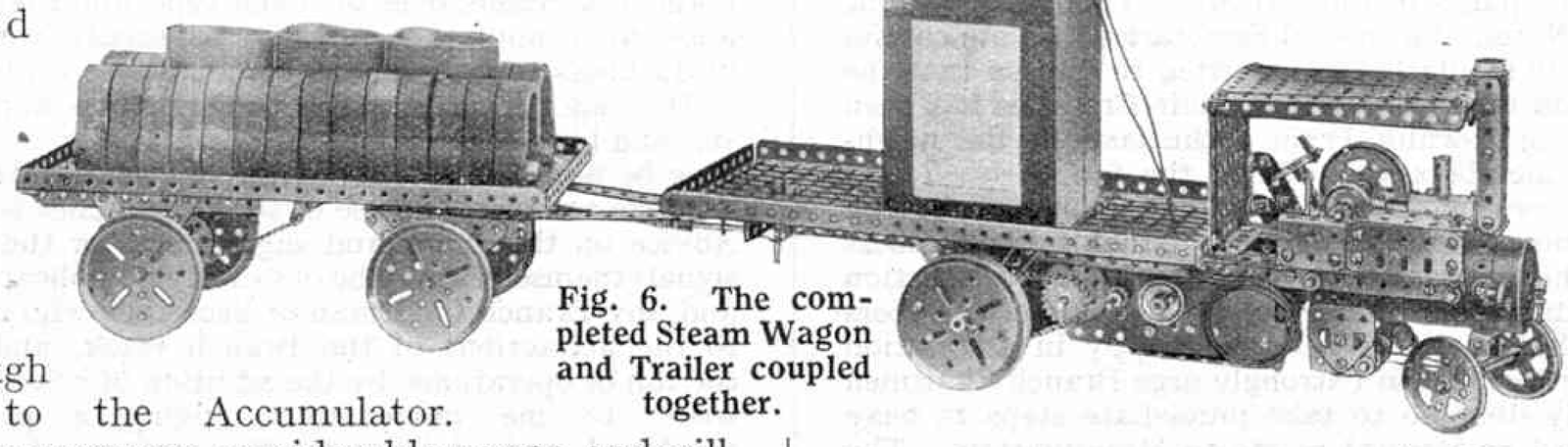


Fig. 6. The completed Steam Wagon and Trailer coupled together.

Construction of the Trailer and Coupling Gear

After the model steam wagon has been completed, the next step is to build the four-wheel trailer shown in Figs. 3 and 4. A Face Plate 1 is bolted to the 12½″ Strips forming the platform, and a 1½″ Rod 2 is secured in its boss and passed through the centre hole of a Boiler End that is held in position by a Collar. Two 3½″ Strips are bolted on top of the Boiler End, and to these, 3½″ × ½″ Double Angle Strips are secured, a Collar and Washers being used in each case for spacing purposes. A further Double Angle Strip, to which the drawbar is secured, is attached loosely by lock-nutted bolts 3. The drawbar proper consists of a 2″ Rod fitted with a small Fork Piece and an End Bearing, and the Rod is free to slide in a Double Bracket. A Spring (part No. 43), attached to the End Bearing by a bolt, is secured to the 3½″ × ½″ Double Angle Strip, and enables the hauling force to be applied gradually to the trailer when starting from rest.

A brake is provided by the Sprocket Chain 4, which passes over a drum formed from a Flanged Wheel and Bush Wheel. The tension on the Chain is varied by operating the hand wheel 5.

In order to build the Steam Wagon the following parts will be required:—

9 of No. 1; 6 of No. 2; 6 of No. 3; 10 of No. 5; 1 of No. 6a; 6 of No. 8; 3 of No. 9; 4 of No. 10; 5 of No. 11; 19 of No. 12; 4 of No. 12a; 1 of No. 15; 2 of No. 15a; 5 of No. 16; 3 of No. 17; 2 of No. 18a; 4 of No. 19b; 4 of No. 20a; 1 of No. 20b; 2 of No. 22; 3 of No. 23; 1 of No. 24; 2 of No. 26; 2 of No. 27a; 2 of No. 29; 1 of No. 32; 1 of No. 35; 127 of No. 37; 5 of No. 37a; 24 of No. 38; 1 of No. 45; 2 of No. 48; 3 of No. 48a; 1 of No. 52; 1 of No. 53; 10 of No. 59; 2 of No. 63; 19″ of No. 94; 2 of No. 95; 2 of No. 96; 2 of No. 103f; 2 of No. 111; 6 of No. 111c; 2 of No. 115; 1 of No. 116a; 1 of No. 125; 4 of No. 126a; 1 of No. 160; 1 of No. 162a; 1 of No. 162b; 1 of No. 163; 1 of No. 164; 1 Electric Motor.

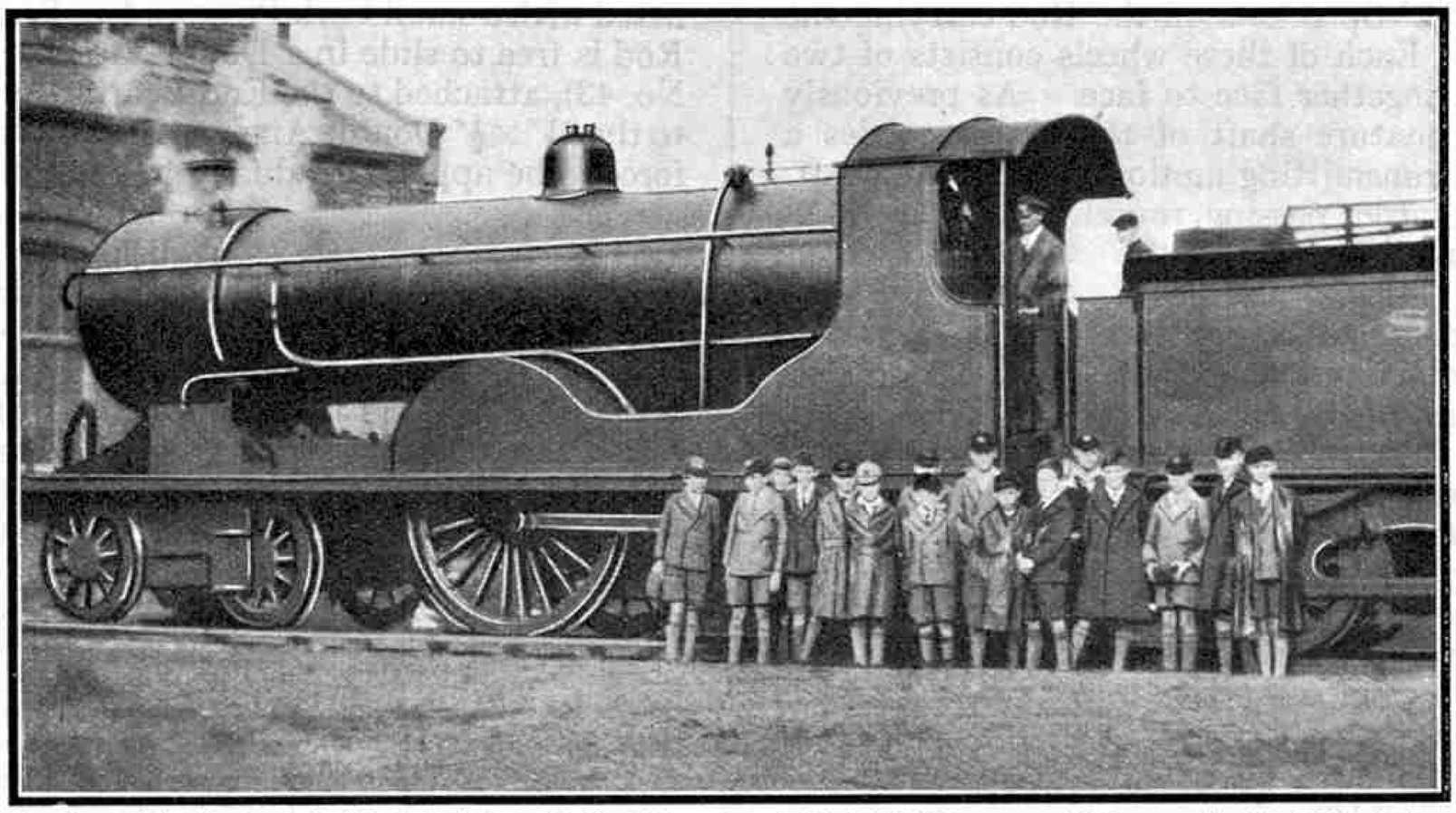
The parts that will be needed for the trailer are:—

9 of No. 1; 4 of No. 2; 4 of No. 3; 8 of No. 5; 2 of No. 8; 4 of No. 9; 2 of No. 10; 1 of No. 11; 2 of No. 15a; 1 of No. 17; 1 of No. 18a; 4 of No. 19b; 1 of No. 20; 1 of No. 24; 68 of No. 37a; 6 of No. 38; 1 of No. 43; 1 of No. 46; 3 of No. 48b; 3 of No. 59; 2 of No. 63; 1 of No. 90a; 7″ of No. 94; 1 of No. 109; 2 of No. 111; 1 of No. 111c; 1 of No. 115; 1 of No. 116 1 of No. 162a; 1 of No. 166.

Settling Down

The festive season has now ended, and Branches have settled down to the regular work of the session. As usual this appears to be excellently varied in character, for the reports that I am receiving from all quarters show that a judicious blend of track work, lectures, debates, and railway visits has been organised by the officials of most Branches. Enthusiasm for operations on Branch layouts continues to increase and many interesting schemes for extending these are being tried out by those who recently were fortunate enough to receive extensive additions to their available supplies of rails, locomotives and rolling stock.

The end of the present session is probably the most suitable time for an Exhibition or Open Night. The chief attraction of such an event must be a miniature railway operated on realistic lines, of course, and I hope that in Branches in which this plan is to be followed care will be taken to work out a practical scheme as soon as possible. In railway operations, especially when carried out before the critical eyes of grown-up relatives and friends, perfection of movement is necessary, and this can only come with practice. The model railway track that is to be employed should be such that a really interesting timetable may be arranged, and it should be laid down in good time in order that opportunities may be given to the members to rehearse carefully the operations involved, and to rearrange any movement that appears to be unsuitable.



Members of the Portsmouth (North End) Branch, No. 134, and a rebuilt 4–4–0 "Drummond" Locomotive No. E472 during an interesting visit to the Fratton Sheds of the Southern Railway.

Photographs of Branch Layouts

There are still a number of local Branches of the H.R.C. in which no serious effort has yet been made to obtain good photographs for these pages. Officials should not forget that the best means of making a Branch known is to have its proceedings well recorded in the H.R.C. pages of the "*M.M.*" This may be done by means of Branch Notes, and several Secretaries who are careful to send in their reports regularly have written to tell me that the appearance of notes on the work done in their Branches has been very useful in inducing Hornby Train enthusiasts in the neighbourhood to become members and join in the fun.

For recruiting purposes photographs are even more satisfactory than reports. Nothing is more likely to attract new members to a Branch than the appearance of an excellent reproduction of a photograph of its model railway or of a group of members whose smiles show that they are perfectly happy in association with each other. For this reason I strongly urge Branch Chairmen who have not already done so to take immediate steps to have photographs taken and to forward prints to Headquarters. The most satisfactory photographs show Branch tracks and rolling stock with members carrying out operations on them. Group photographs also are very useful, but I am always pleased to receive any interesting pictorial records of Branches and their work, and if possible to reproduce these in the pages of the "*M.M.*"

Stimulating Enthusiasm

I may also remind officials that the appearance of a good representative photograph of his Branch on the H.R.C. pages gives the average member a feeling that the work he is doing is worth while. His enthusiasm is stimulated and his satisfaction invariably shows itself in his continued good work on behalf of his Branch.

Branch photographs are sometimes of value in unexpected ways. In one remarkable instance that has been brought to my notice it was proposed to take a photograph of the miniature railway layout on which Branch operations are performed. Several members immediately objected that it was scarcely sufficiently attractive to make photography worth while. The Branch Chairman seized this opportunity very neatly and retorted that it was up to the members to build up a miniature railway really worthy of reproduction on a photographic film. The members immediately responded to this appeal and the work of bringing the Branch layout up to date, and of providing it with attractive scenic accessories, was undertaken with great enthusiasm.

Colour Light Signals on Miniature Railways

Modern railway practice in signalling tends more and more toward the adoption of colour light signals, and in many Branches miniature representations of these have been introduced with success. I hope other Branches will follow this example, for colour light signals have many advantages over the older type, and they give a good appearance to a miniature railway, especially when this is operated in darkness to resemble night conditions on real railways.

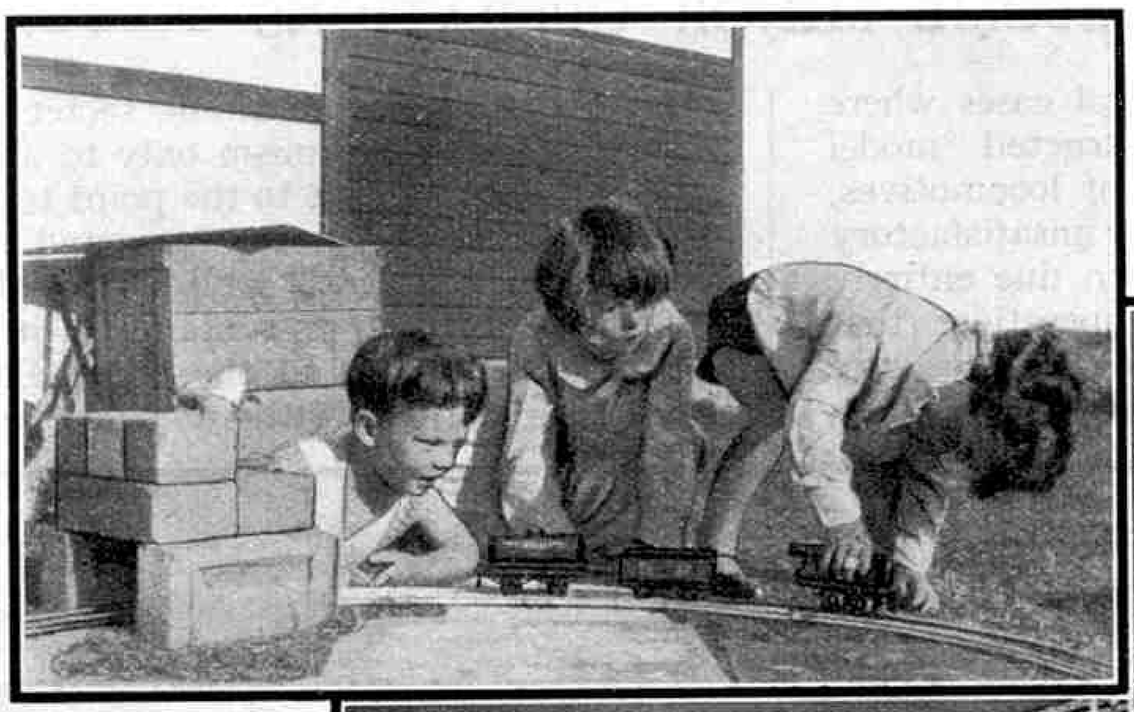
The exact form in which the system is applied depends on the size and type of the layout on which it is to be installed. Signalling may be automatic in character but near stations, and on layouts that are complex, the use of simple switches is probably advisable. Advice on this point and suggestions for the construction of the signals themselves may be obtained on application to Headquarters, and any Branch Chairman or Secretary who is thinking of adding to the attractions of the Branch track, and of thus increasing the fun of operations, by the addition of colour light signals should write to me immediately, giving a plan of the layout employed and details of the system of working that it is hoped to introduce.

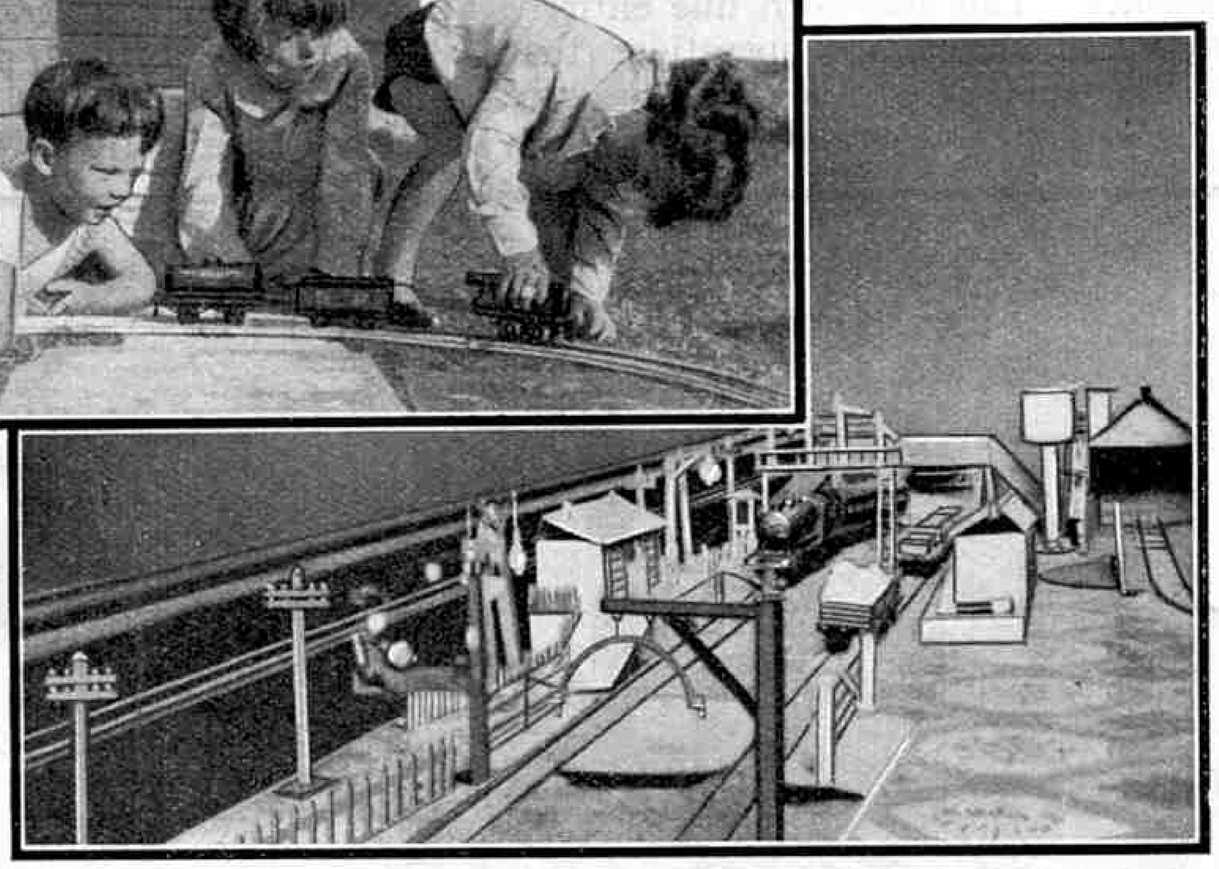
Branch Notes

GLOUCESTER.—An interesting lecture on steam cranes was given by a former official of the G.W.R., who dealt with the peculiarities of the steam cranes used for various types of cargo. A talk on the duties of a passenger guard also has been given by an L.M.S. guard, who pointed out that the chief duty of this official really is to "guard," or protect his train. Secretary: George T. Clark, 66, Falkner Street, Gloucester.

WIMBORNE GRAMMAR SCHOOL.—The main track has been extended and new sidings added. Sub-committees have been appointed to deal with track maintenance, electric light repairs and extension, care of locomotives and lineside features respectively. Rules for timetable working and care of the Branch stock have been drawn up and small fines are imposed on members who do not observe them. Secretary: A. M. Hooper, 98, Upper Shaftesbury Avenue, Highfield, Southampton.

ROKEBY (SPALDING).—The Branch track now covers the floors of two large rooms. It is divided into sections and when funds permit Hornby Control for signals and points will be installed. A local railway official has promised to give lectures on *"The practical working of a railway."* Secretary: Mrs. P. Robinson, 49, Pinchbeck Road, Spalding.





(Above) Model railway working demands great care and concentration, as our photograph of Hornby Train enthusiasts shows. (Right) An interesting corner of the layout of E. C. Stonyer (H.R.C. 10306).

WEST NORWOOD.—Members visited Camden Sheds of the L.M.S., where the driving mechanisms of locomotives of the "Royal Scot," rebuilt "Claughton," original "Claughton," "Midland Compound" and mixed traffic "Mogul" classes were demonstrated to them. Among the engines seen were No. 6168, *"The Girl Guide,"* one of the last two of the most recent batch of "Royal Scots," and No. 6113 *"Cameronian,"* the locomotive that in April, 1928, ran non-stop from Euston to Glasgow. Members were also interested in the ascent of Camden bank by the *"Mancunian,"* headed by No. 6140 *"Hector."* Secretary: W. H. Bugg, 80, Wolfington Road, West Norwood, London, S.E.27.

EPSOM.—J. F. L. Long, one of the members, gave an interesting talk entitled *"My Cruise to Portugal."* He also included a description of his visit to the works of Meccano Limited at Liverpool. The Branch layout is now entirely double track, and several trains can be run at the same time. Each member is given charge of a section of track and one locomotive. It has been found that by this plan the track is kept in better order and the number of accidents is reduced. Secretary: C. B. White, "Ranworth," Kingsdown Road, Epsom, Surrey.

HADFIELD (SPRING BANK).—Interesting lectures on *"Bell Signalling"* have been given by the Chairman and members have become so interested that this system has been introduced into the working of the Branch track. The layout has been divided into two blocks and signals in accordance with the correct code now govern operations. Secretary: Arthur Aldous, 1, Marlow Street, Hadfield, Manchester.

MAIDSTONE.—Lectures on *"Electricity"* are being given by the Chairman. The working of dynamos has been explained and later talks in the series will deal with electric locomotives. Interesting experiments have been carried out with cardboard coaches made by one of the members. A competition for the plan of a layout has been announced and a prize of 2/6 is to be given for the best scheme. Secretary: S. C. Wicks, 24, Marion Crescent, Plains Avenue, Maidstone, Kent.

ST. ANDREW'S CHURCH (COBHAM).—Practice with terminus-to-terminus double line working has taken place and an attempt was made to operate the track to timetable. This was found rather difficult at first, but practice soon simplified matters. At a subsequent meeting two goods and three passenger trains were successfully operated to timetable on a double track, non-continuous layout with two wayside stations. The sections of Branch track to be laid down between stations are screwed on wood bases, in order that the layout may be varied without being entirely rebuilt. Secretary: A. J. West, "Fernlea," 13, Freelands Road, Cobham, Surrey.

SOUTH BIRMINGHAM.—The sidings on the L.M.S. section of the Branch track have been enlarged and the "Friary" main terminus station has been roofed with celluloid and provided with carriage sidings. Suburban train sets are now run on both L.M.S. and G.W. sections. Electric lighting for stations and goods yards has been installed and colour light signalling introduced in the main stations. Visitors' Nights have been very successful and have aroused keen interest in the work of the Branch. Secretary: E. Sharp, 156, All Saints Road, King's Heath, Birmingham.

Further Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given here. All owners of Hornby trains or accessories are eligible for membership and the various secretaries will be pleased to extend a warm welcome to all who send in their applications:—

ASHFORD—Peter Brown, Stone House, Kennington, Ashford.

BAMFORD—A. S. Harmer, Police House, Main Road, Bamford, via Sheffield.

BIRMINGHAM—G. Joyner, 146, Station Road, Stechford, Birmingham.

BOGNOR REGIS—Raymond S. B. Knowles, "Cliftonville," Canada Grove, Bognor Regis, Sussex.

COCKERMOUTH—R. C. Pattinson, The Towers, Cockermouth.

DUNDEE—Tom Sharpe, 12, King Street, Dundee.

EAST KESWICK—J. Smart, 12, Allerton Drive, East Keswick, Yorkshire.

HERTFORD—L. Pitcher, W.B.T.S. Goldings, Hertford, Herts.

JERSEY—J. M. du Pré, Le Grouet, Corbiére, Jersey.

LISBURN—W. E. Boyd, "Altona," 1, Wallace Avenue, Lisburn, N. Ireland.

LONDON, N.13—R. J. Cotton, 236, Princes Avenue, Palmers Green, London, N.13.

LONDON, S.W.6—J. King, 317, New King's Road, Fulham, London, S.W.6.

NOTTINGHAM—L. Burdell, 48, Sneinton Hermitage, Nottingham.

OSWESTRY—J. F. Grindley, Kepler Cottage, Whittington, Nr. Oswestry.

POLMONT—T. Meikle, Blair Lodge, Polmont, Stirlingshire.

PORTSMOUTH—Mr. J. S. Kent, "Rustington," 57, Kirby Road, North End, Portsmouth.

REDRUTH—C. Perryman, 22, Adelaide Road, Redruth, Cornwall.

SIDMOUTH—Mr. H. E. Scadding, "Fourways," Glen Road, Sidmouth, S. Devon.

SLOUGH—F. K. Hare, "Wyleigh," Windsor Road, Slough, Bucks.

WEST MEON—E. W. Deane, Westbury House, West Meon, Nr. Petersfield, Hants.

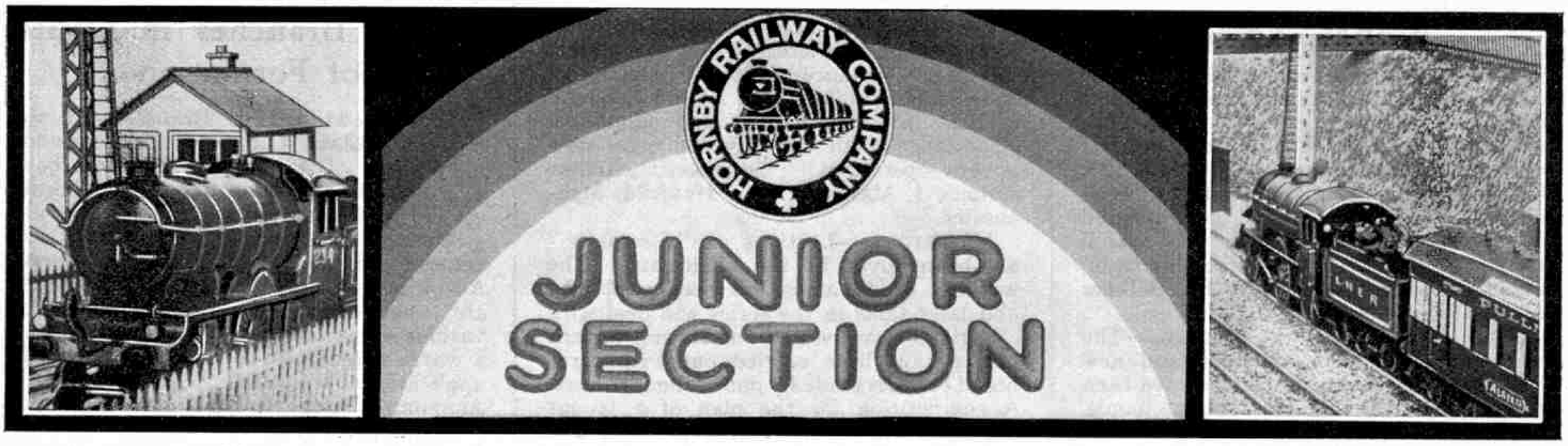
WILMSLOW—J. Manby, The Croft, Hill Top, Wilmslow, Cheshire.

Further H.R.C. Incorporated Branches

152. SANDFORD (BIRMINGHAM)—E. P. Neep, 104, Sandford Road, Moseley, Birmingham.

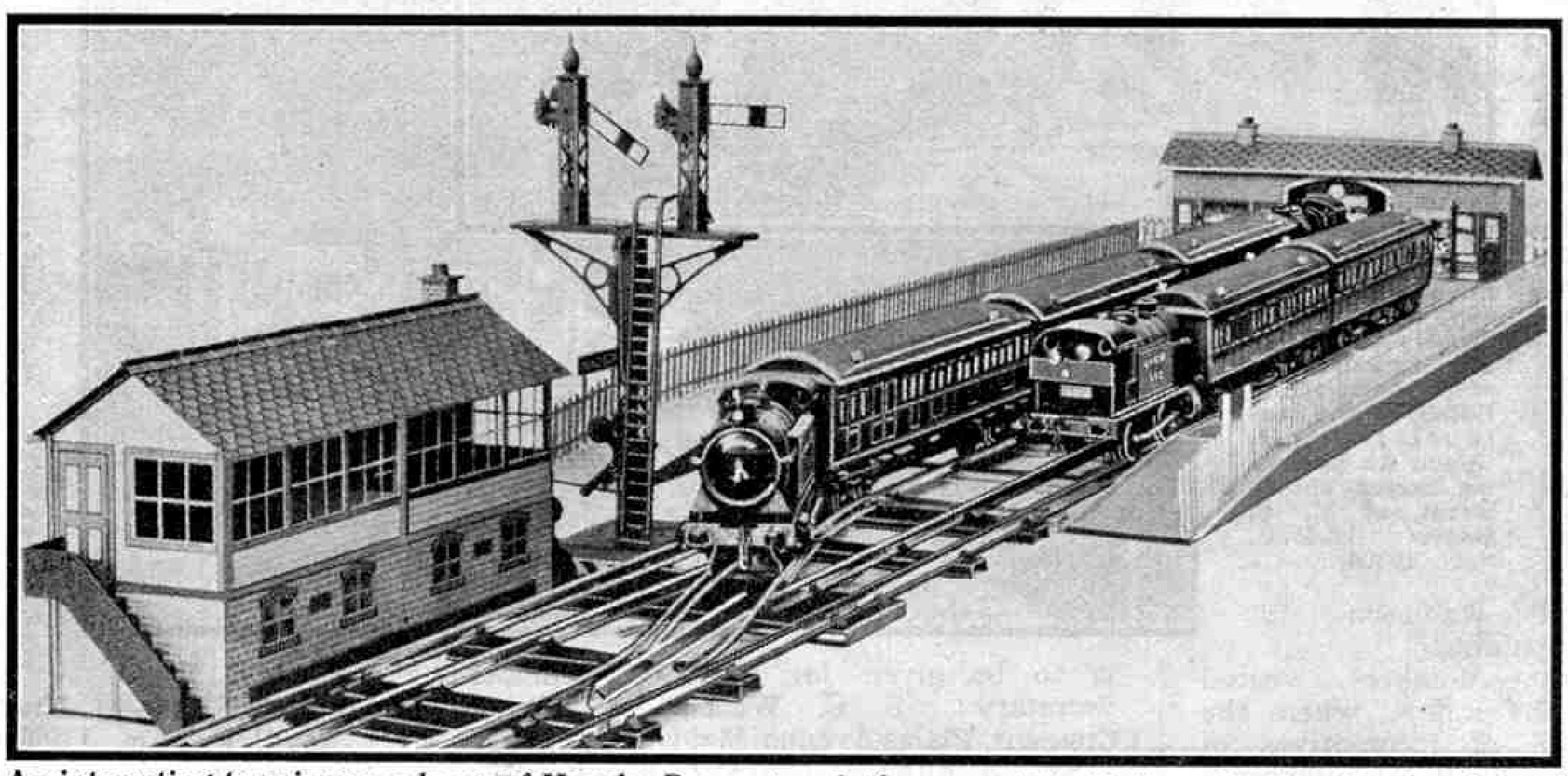
153. HOLEBARN (NORTHFIELD)—Ian K. H. Cooke, 165, Hole Lane, Northfield, Birmingham.

154. DALKEY—J. W. L. Martin, Villaggio, Coliemore Road, Dalkey, Co. Dublin.



XXVI.—SOME MINOR OPERATIONS

WE have recently come across several cases where a well-planned and well-constructed model railway, with an ample supply of locomotives, rolling stock and accessories has given very unsatisfactory and disappointing results. This has been due entirely to the fact that many of the minor operations that together make up the running of the railway were either carried out on wrong and unrailway-like lines, or were performed so carelessly as to spoil the effect entirely. There is far more real fun to be obtained from the successful carrying out of a small railway-like movement than from a large-scale operation performed carelessly and clumsily, so that hitches occur continually. This month we propose to deal with a few typical minor operations, and to give hints as to the best method of dealing with them.



An interesting terminus made up of Hornby Passenger platforms and the Railway Station No. 2. A local train is leaving headed by a No. 1 Special Tank Locomotive.

First of all let us imagine that we are taking a locomotive from the shed for an express run. We will assume that the railway is laid down and that all is ready for work to commence, the train being made up and waiting at its platform. We, representing the driver and the fireman, arrive at the shed and examine the working timetables and any other notices. We will suppose that it is a No. 1 Special Locomotive that we are to drive, and that our engine is standing just outside the shed. First of all we proceed to examine the engine to see that all its working parts are in good order, and to apply a little oil where necessary, taking special care that no oil is allowed to find its way on to the rails. We also make sure that the treads of the driving wheels are clean and free from grease, as otherwise the engine might have a tendency to slip. After our general inspection the engine is run on to the turntable, turned, and then sent off to the station.

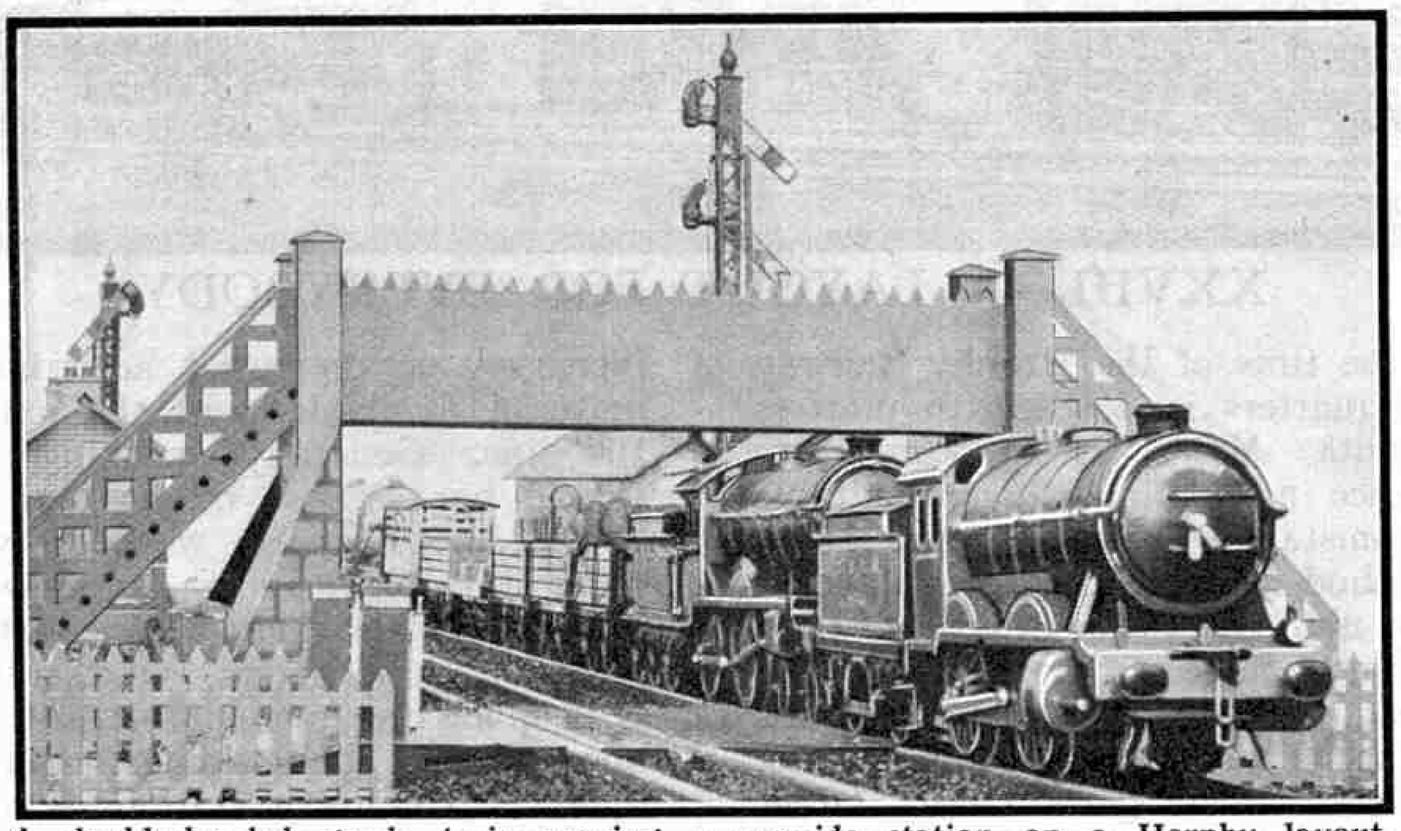
The movements that we have just mentioned are very simple, but extremely interesting if carried out in the correct manner. The whole secret lies in winding up the clockwork mechanism only to a sufficient extent to propel the locomotive to the point to which it is required to travel. If the motor is wound up to the full, the engine starts off with such a rush that it is extremely difficult to bring it to a standstill in the short distance between the shed and the turntable, or the turntable and the station, without some such unrailway-like proceeding as making a wild grab at it with the hand! It is quite easy, by means of a few interesting experiments, to find out exactly how many turns of the winding key are required to make the engine travel light, or with a certain load, for a given distance. The results of these tests should be noted down, and then, if we always arrange to have the same distance between the shed and the turntable and the turntable and the platform, we can carry out our winding in such a manner as to bring the engine gently to rest exactly in the required position.

It is wonderfully fascinating to watch an engine travel on its own account from one point to another, and, as it were, bring itself to a standstill without any handling. Still more striking is the effect obtained when an engine is backed on to its train, and runs up to the front coach with just the gentlest of bumps. We strongly advise readers who have not experimented with partial winding for such operations to do so at once, because we are sure they will feel an entirely new interest in their model railway operations.

When our locomotive is in position at the head of its train, we couple it up, take a general look round to see that all is in order, and place the headlamps in the correct positions. These lamps give the train a wonderfully realistic appearance, and indeed if they are omitted the engine always seems to have something the matter with it. The correct arrangement of these lamps for

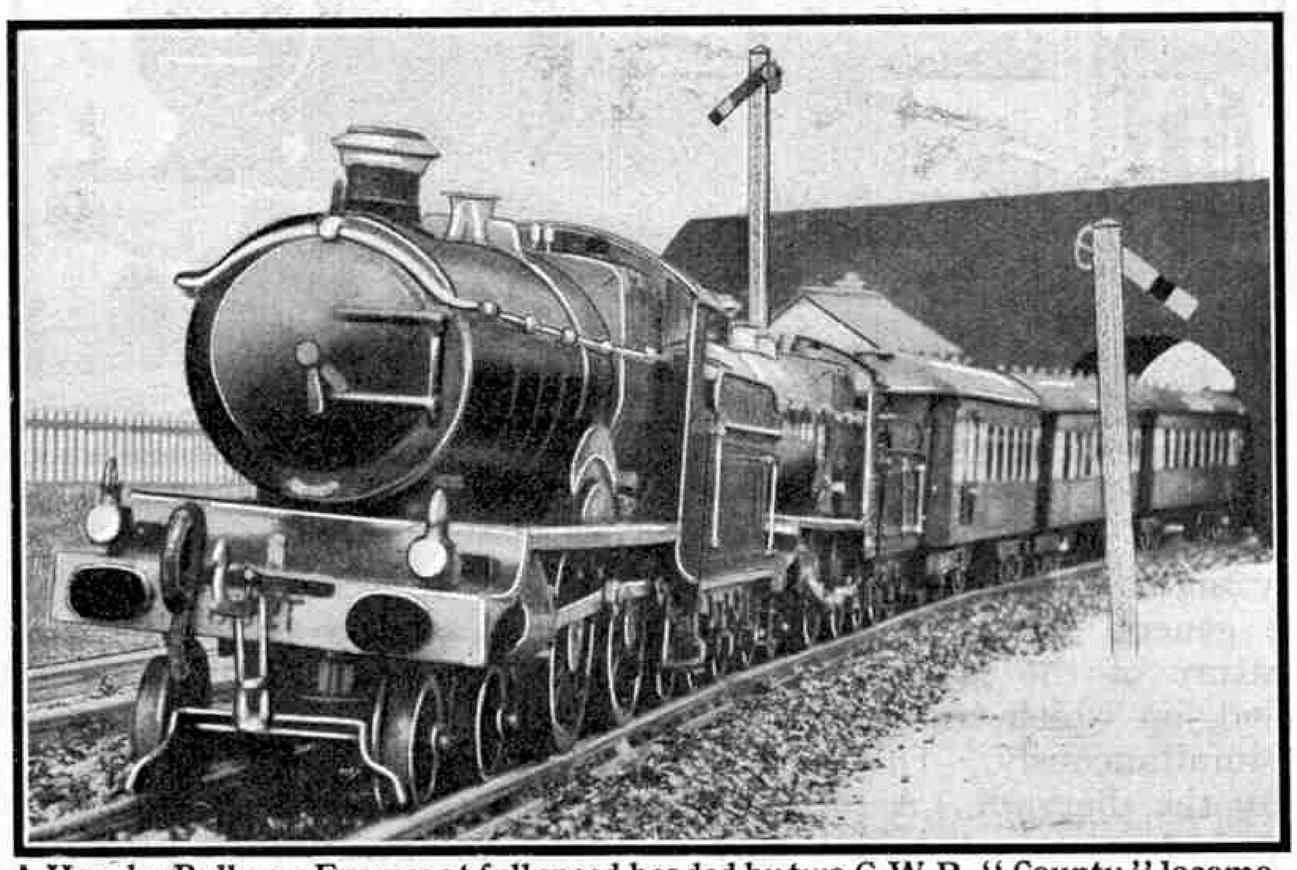
trains of different types was illustrated and described on page 148 of the "*M.M.*" for February 1930.

When all these preparations are complete, the locomotive may be wound sufficiently to take it along to the first station at which it is required to stop, or it may be wound to a greater extent and the stopping be brought about by means of the brake rail. The appearance of the locomotive slowing down as the station is reached, is, of course, much more realistic than its comparatively sudden stoppage by means of the brake rail. In any case this rail should not be used at a point where the engine is likely to be travelling at full speed, otherwise derailment or a general mix-up of the coaches forming the train is likely to result.



A double-headed goods train passing a wayside station on a Hornby layout. The footbridge has been modified, by the use of thin card, to appear as if it is boarded up.

Shunting provides unlimited opportunities for the controlled winding to which we have referred. Take, for instance, the problem of shunting a goods train into a siding by giving the engine mechanism the correct number of turns. The goods train is hauled, perhaps, by a No. 2 Special Tank and has to be placed in a siding alongside the main line. The train proceeds along this line and over the trailing points, where the siding joins it. A few rail lengths beyond this junction a reverse rail is placed, together with a "home" signal. As soon as the train reaches the reverse rail, which is in the "on" position, the signal being at "danger," the engine is reversed. The points are then quickly set for the siding, into which the train backs gently, and comes to rest with the buffers of the guard's van just touching the buffer stops at the end of the siding. The effect of this operation, if properly carried out, is wonderfully realistic, and we think all H.R.C. members will agree that it is much to be preferred to the wild scramble that so often takes place, resulting in the train crashing into the buffer stops, and perhaps upsetting every accessory in the vicinity.



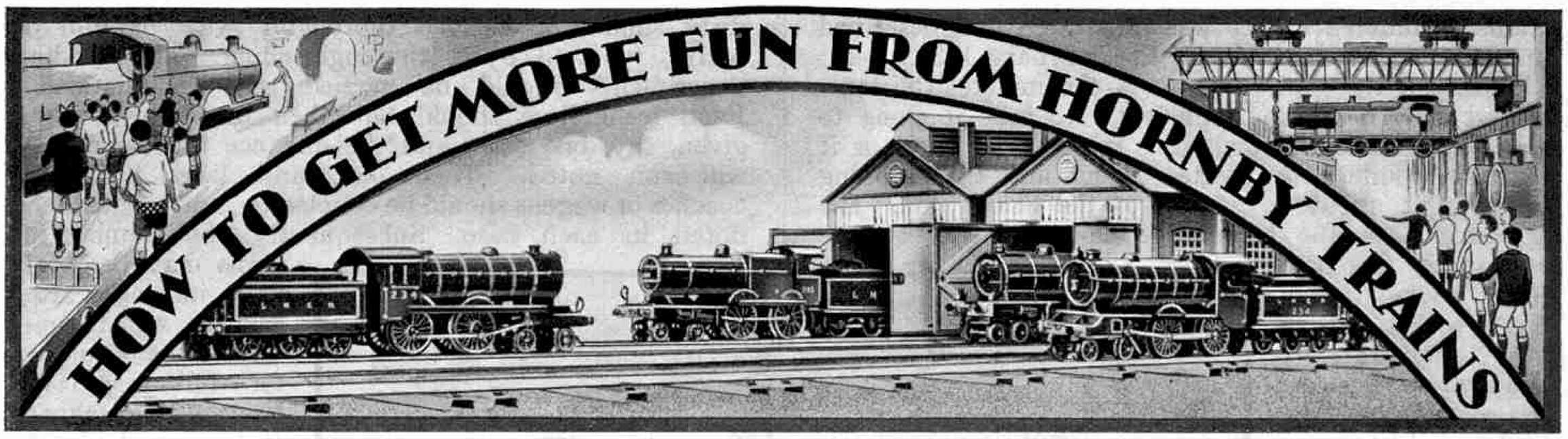
A Hornby Pullman Express at full speed headed by two G.W.R. "County" locomotives. The simple but effective appearance of the M Series signals will be noticed.

In order to carry out these partial-winding operations successfully it is necessary that the clockwork motors of the engines should be kept in first-class condition. This means that they must be oiled carefully from time to time, and when they become at all dirty should be cleaned thoroughly with paraffin or petrol, followed by a thorough oiling. The winding experiments should be carried out systematically. Each locomotive should be taken in turn, the key given, say, one turn, and the distance the locomotive will run noted. Then one, and later additional coaches or wagons should be coupled on, and the distance noted in each case. Subsequently the number of turns may be gradually increased after each experiment, until the number for full winding have been reached. It is a good idea to make the test with each different winding at least three times so as to obtain a reliable average.

The results obtained in this manner will be of greatest interest if they are carried out in the form of a table. A sheet of paper should be ruled with columns, bearing the headings "Class of Locomotive," "Number of Locomotive," "Load," "Number of Turns of Key," "Distance Traversed," and "Remarks." The distance traversed should not be measured in inches, but in rail lengths, and notes should be made as to the effect of curves, for these have the effect of shortening the run, as compared with the distance traversed entirely on straight rails.

Under the "Load" column separate headings may be drawn for wagons and coaches, giving if possible the type of each. For instance, we might find that a certain locomotive hauled four No. 2 Special Pullman Coaches a certain distance on being given a certain number of turns of the key. Therefore, in the space for coaches we might enter "4 S.P.," suitable abbreviations such as this being used. The initials of the various Hornby trucks may also be used, such as "No. 2.L.W." to indicate No. 2 Lumber Wagon. This use of code letters for the various pieces of rolling stock would follow actual practice, as they are frequently used in railway work, together with a number of code-names.

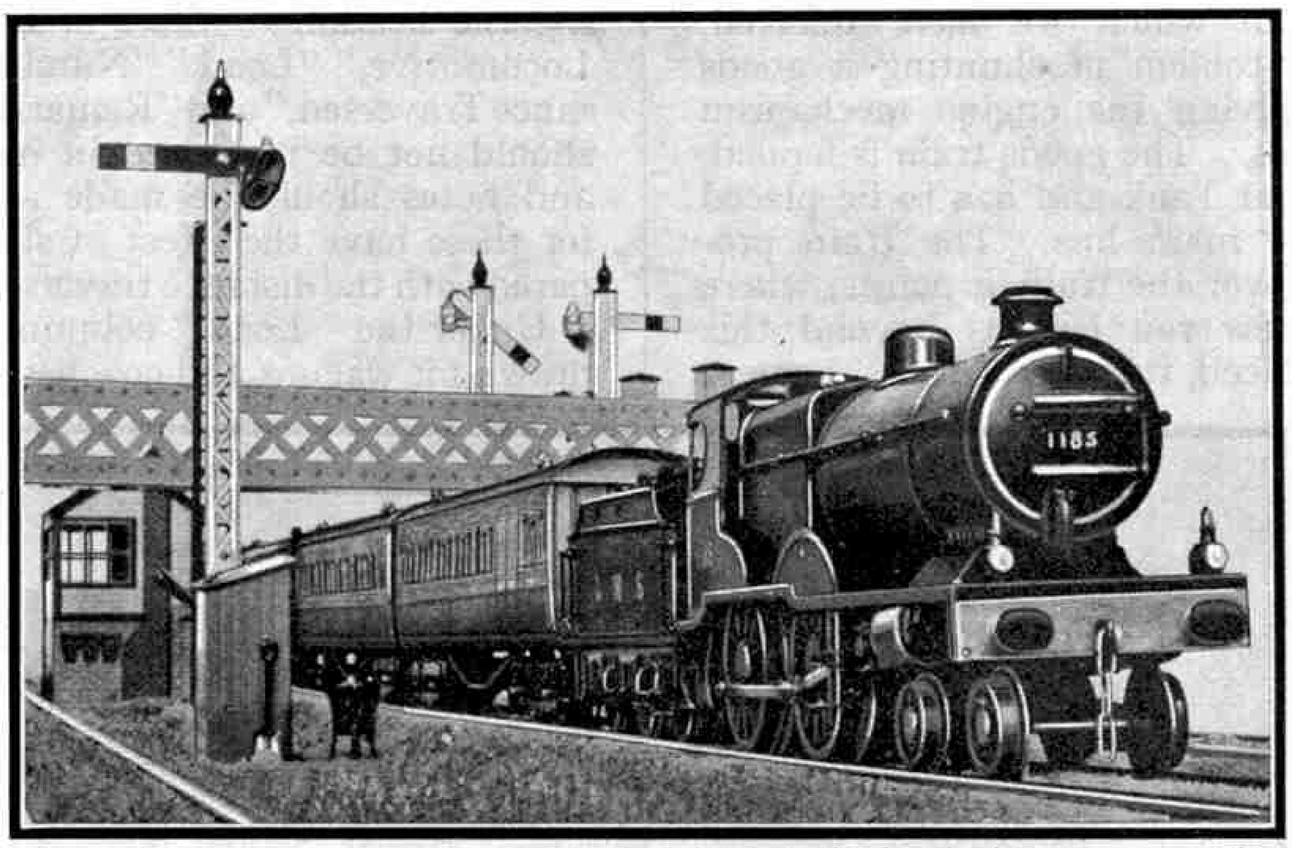
Similarly under the column headed "Distance Traversed" we might include straight and curved rails separately. Where points are used the length of the curved branch will, of course, be counted as one curve. Model railway owners will be able to find by comparison the various lengths in curves and straights of the different rails, points and crossings in the Hornby Series.



XXVIII.—A LAYOUT FOR EVERYBODY

A GREAT deal of the time of the Hornby Railway experts at Headquarters is devoted to matters concerning layouts. Many H.R.C. members write to ask for assistance in planning a layout suitable to their special circumstances; while others seek advice on the best method of developing their layouts on railway-like lines, so as to add to the interest of their train working. A considerable proportion of the layouts prepared at Headquarters to meet these demands are planned to meet special and unusual requirements, and therefore are not suitable for general use. Other layouts, however, are of such a nature that they can be employed successfully by almost any model railway owner, and during this year we propose to illustrate and describe some of the more interesting of these schemes.

This month we deal with a layout which, while not elaborate or necessarily costly, provides almost endless possibilities for fun and excitement. We have said "not necessarily costly," because one of the interesting features of the layout is that, within wide limits, it can be increased or decreased in size, according to the space and the amount of railway material available, without any interference with the general scheme.



The Hornby "L.M.S. Compound" locomotive at the head of an express train. The Lattice Girder Bridge is effective and a final touch of realism is given by the Watchman's Hut.

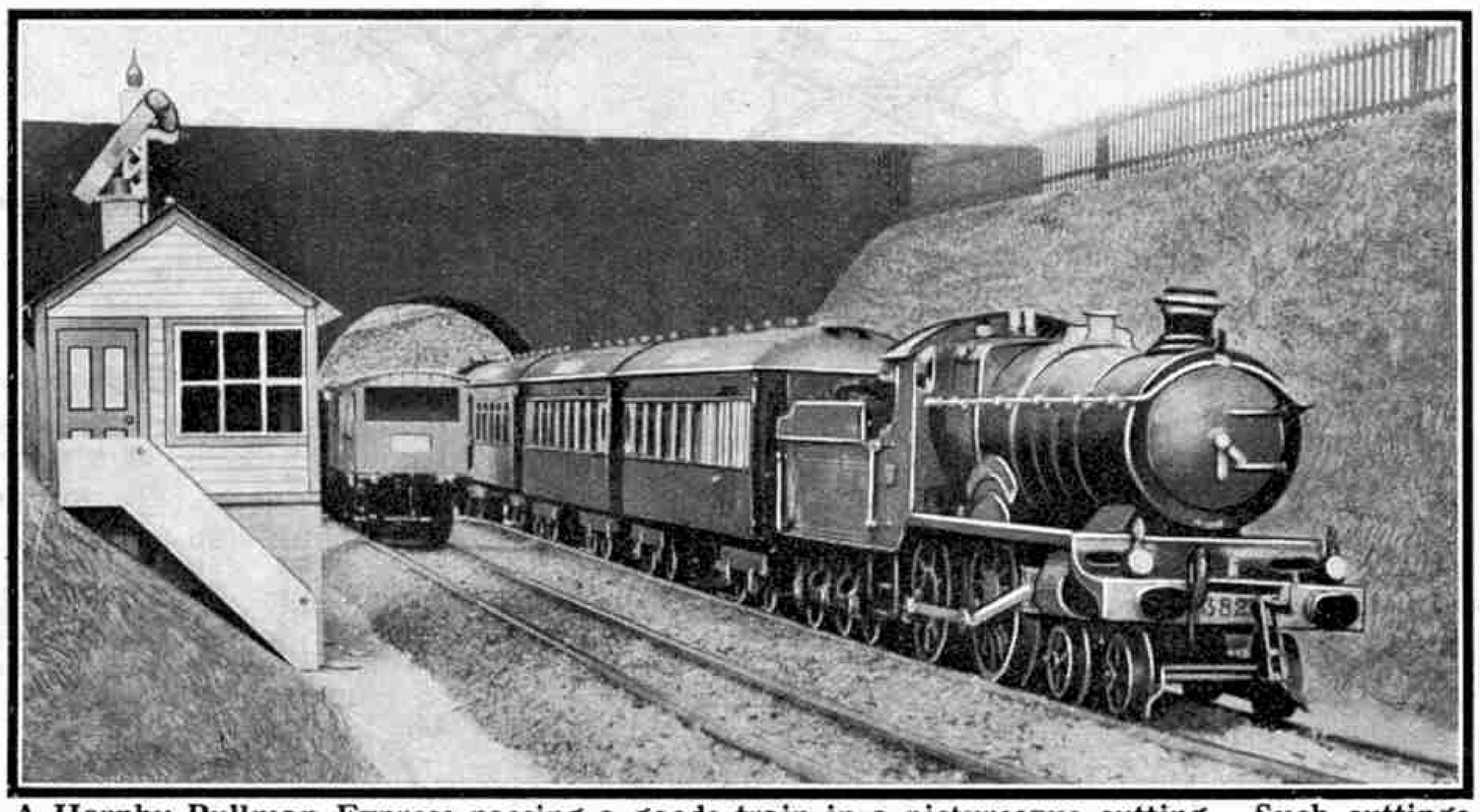
The most important feature of the layout is that two oval tracks are included, on which trains may be run either alternately or simultaneously. The general idea is made quite clear by the diagram. A terminal passenger station is included, from which trains may start and at which they may be terminated. This station consists of three platform roads with a main circulating area at the rear. The construction of the station itself is not of great importance, and it may be built according to the railway owner's ideas and material. A goods station is situated close to the passenger station, and it consists of a platform for the loading and unloading of goods, together with sidings for the accommodation of trucks and for shunting operations. The number of these sidings may be increased or decreased according to the space and material available, and the extent of the traffic on the line. Generally speaking, however, the sidings should be too few rather than too many, especially if the line is being worked by one operator. Two other stations, B and C, are shown in the diagram, but if desired others may be added to give greater variety to the train journeys. Of the two stations indicated, B is much the more important as it possesses a loop line and two goods sidings. Station C may be looked upon as a country station or halt.

Traffic on this layout might be operated by a No. 2 Special Locomotive, two No. 1 Special Tender Locomotives, and one No. 1 Special Tank; but of course this is only a suggestion, and operations can be carried out quite well with other engines. A No. 2 Engine Shed is included in the scheme, and this is placed conveniently adjacent to the station with a turntable alongside. The four carriage sidings are also in a convenient position and provide accommodation that will be ample for the requirements of most railway owners. A trailing crossover is placed between the platform roads 1 and 2, and by means of this an engine may run round its train on arrival. This feature is particularly valuable on a miniature line, where the locomotive stock is necessarily limited.

Let us now imagine that we are running an express train to operate from platform 1 at the main station A. A No. 1 Special Tank, or other suitable engine, proceeds from the shed to the carriage sidings, where the train is made up in the proper order. The tank then hauls the coaches into platform 1, which we may decide to regard as the main departure platform. Now the locomotive that is to haul the train proceeds from the shed to the turntable, where it is turned if necessary; and then passes on to the station and backs gently on to its train. At the appointed time the train starts on its journey and proceeds via either of the running

lines X or Y, as shown in the diagram. It then traverses the inner oval once, and comes to rest, if desired, at the suburban station B, after which its non-stop run commences. We will now leave the train to proceed on its journey on the layout, being switched from the inner oval to the other as required.

Returning to the main station, we find that just prior to the departure of our express a local train arrived in platform 2. When our train left, the tank locomotive that had brought the coaches in to platform 1 gave us a helping push from the rear and then went on to platform 2 and backed on to the local train waiting in that platform, departing with it shortly afterwards. When this local train is on its journey there will be two trains on the layout simultaneously, and the operators will be provided with endless fun in operating the trains so that collisions are avoided. The best results will be obtained, of course, if some systematic scheme of working is employed; or better still, a proper timetable.



A Hornby Pullman Express passing a goods train in a picturesque cutting. Such cuttings may be readily reproduced by the use of brown paper suitably finished, while the overbridge shown is constructed of cardboard.

In order to make the layout still more "intensive" we will imagine that a goods locomotive, perhaps of the No. 1 Special Tender class, shunts and makes up a train of goods vehicles in the goods sidings at A, and then hauls its train out on to the main line. In order to accomplish such intricate working, and to carry out all the necessary movements quickly and successfully, more than one operator will be necessary. There is, in fact, plenty for several operators to do, and on this account this layout should prove very useful for H.R.C. Branches.

When required, the local train may be placed in the siding at B, in order to allow the express to pass on the main line. The local may also be conveniently terminated at B at the end of its journey, and the locomotive run round the train ready for the return journey to A. This will allow of a regular local service between A and B being included in the timetable. The goods train also may be either terminated at the goods siding at B, or may finally reach its destination at A. During its run it may call at B as many times as required, in order to perform the usual routine work in picking up or detaching vehicles.

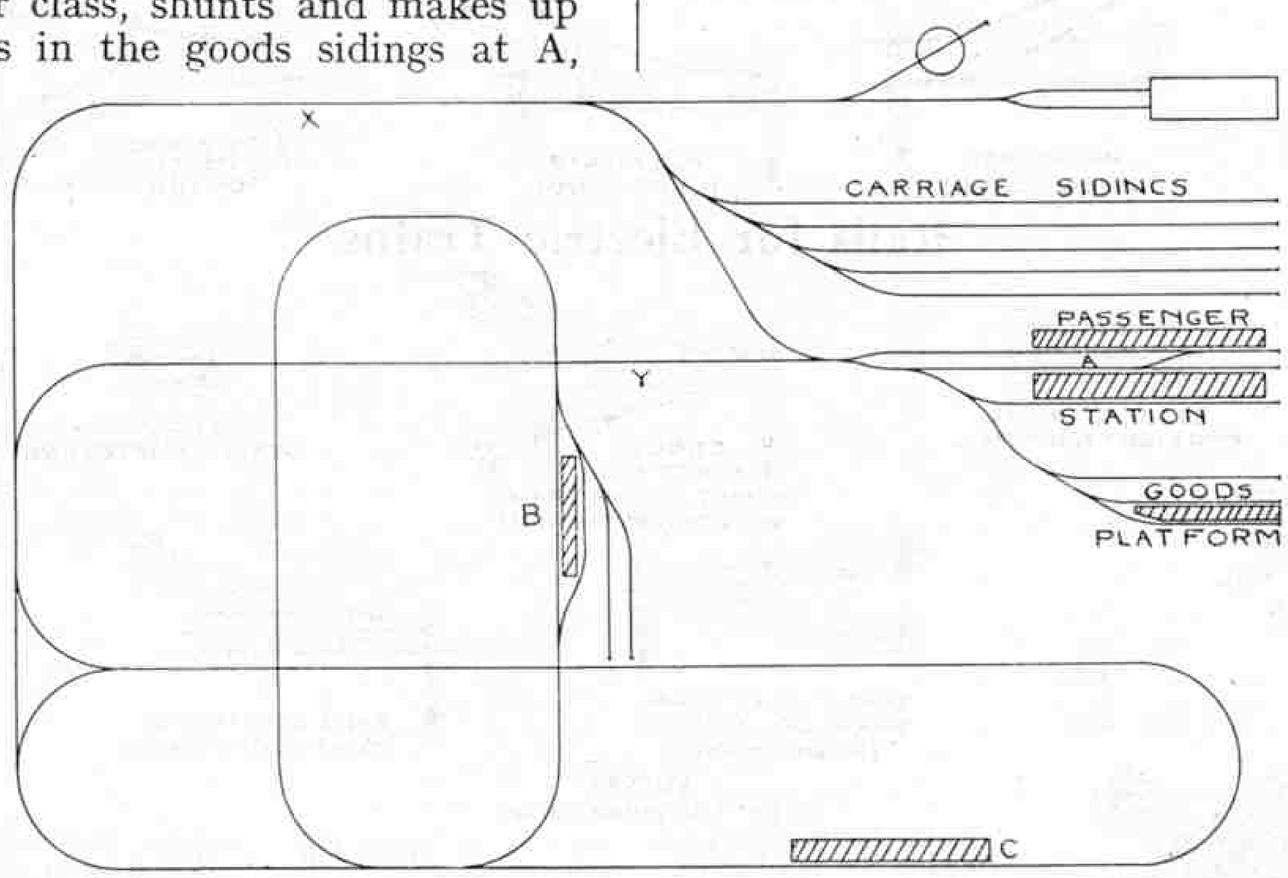


Diagram of the interesting layout described in this article.

Throughout the operations the express will of course receive first consideration, so far as right of way is concerned. When it has called at B as often as is desired, it may return, by either of the running lines X and Y, to the main station at A, where it is terminated. The carriages, if they are not required to form an outgoing train, will be backed on to the sidings by the locomotive, which may then proceed to the running shed and, after having been turned, be ready for another run.

As we have already said, the size of the layout will vary according to circumstances. The length of the running tracks X and Y leading from the station A may be built to almost any length, provided that the oval on which station C is situated is also increased in length. The length of the oval upon which station B is situated will depend on the length of the section of track between the triangle junction and the point at which the direct line from the terminus and the longer line unite. The triangle will be found very useful on occasions for turning locomotives.

The layout includes four right-angle crossings, an unusual number for any one layout. It is interesting to note that on the L.N.E.R. main line to the North there are two places where another main line crosses on the level. These are at Retford, where the old G.C.R. main line crosses that of the former G.N. system; and at Newark. At the latter place the crossing is controlled by the L.M.S. signalman, who thus is able, if necessary, to hold up even the famous "*Flying Scotsman*"! If the Hornby Control System is used on the layout, two signal boxes will be required to control station A. One may be placed at the end of the platforms. From this point the station and goods lines will be directly under the control of the signalman, and a good view of the operations carried out on them will be obtained from the box. The other may be placed between the junctions of the engine shed line and the carriage sidings with the main line, and may be appropriately known as Engine Shed Junction Box. There is usually a signal box in a position of this kind, and such boxes are commonly named in this manner.

Rails, Points and Crossings

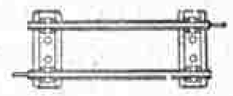
Hornby Series

Alternate Pegs — **Gauge 0, 1¼″**

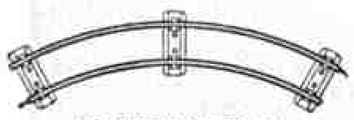
HORNBY Rails, Points and Crossings are built for hard wear and smooth running. They are made of the finest materials and hold together rigidly and strongly, for real workmanship is put into them. Note the great superiority, both in quality and appearance, of the Hornby Rails.

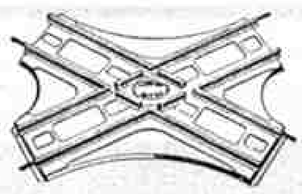
Rails for Clockwork and Steam Trains

A1½ CURVED HALF RAIL

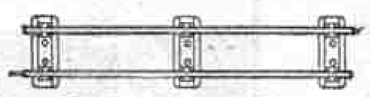

B½ STRAIGHT HALF RAIL

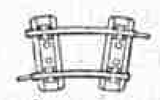
B¼ STRAIGHT QUARTER RAIL

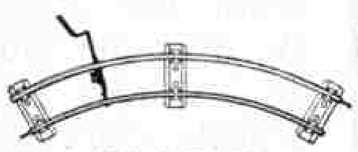

A1 CURVED RAIL

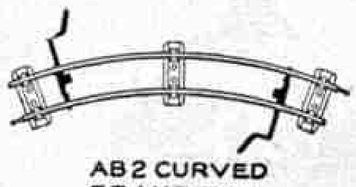

CA2 ACUTE-ANGLE CROSSING

CR2 RIGHT-ANGLE CROSSING


B1 STRAIGHT RAIL


A1¼ CURVED QUARTER RAIL


AB1 CURVED BRAKE RAIL


AB2 CURVED BRAKE RAIL

CURVED RAILS

M9	Curved rails (9-in. radius for M0 Trains)	doz.		3/–
MB9	Curved brake rails (9-in. radius for M0 Trains)	each		3½d.
A1	Curved rails (1-ft. radius) ...	doz.		4/6
A1½	Curved half rails „ ...	„		3/6
A1¼	Curved quarter rails „ ...	„		3/–
AB1	Curved brake rails „ ...	each		6d.
A2	Curved rails (2-ft. radius) ...	doz.		4/6
A2½	Curved half rails „ ...	„		3/6
A2¼	Curved quarter rails „ ...	„		3/–
AB2	Curved brake rails „ ...	each		6d.
DC2	Curved rails, double track, 2-ft. radius	½ doz.		7/6
RCP	Rail connecting plates	½ doz.		4d.

CROSSINGS

CA1	Acute-angle crossings (for 1-ft. radius tracks)	each		2/–
CA2	Acute-angle crossings (for 2-ft. radius tracks)	„		1/9
CR1	Right-angle crossings (for 1-ft. radius tracks)	„		2/–
CR2	Right-angle crossings (for 2-ft. radius tracks)	„		1/9

POINTS

For 9-in. radius curves (for M0 Trains)

MR9	Points, right-hand	pair	3/–
ML9	Points, left-hand		

For 1-ft. radius curves

PR1	Points, right-hand	pair	4/–
PL1	Points, left-hand		

For 2-ft. radius curves

PR2	Points, right-hand	pair	4/–
PL2	Points, left-hand		
PSR2	Points, on solid base, with ground disc and lamp, right-hand ...	pair	8/6
PSL2	Do., do., left-hand		

DOUBLE SYMMETRICAL POINTS

For 1-ft. radius curves

DSR1	Double symmetrical points, right	pair	5/–
DSL1	Do., do., left		

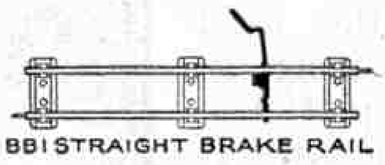
For 2-ft. radius curves

DSR2	Double symmetrical points, right	pair	5/–
DSL2	Do., do., left		

PARALLEL POINTS

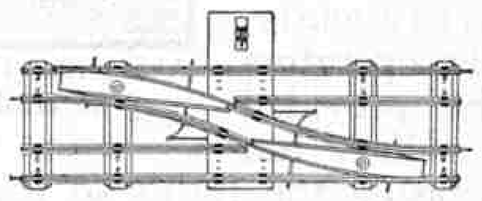
For 2-ft. radius curves

PPR2	Parallel points, right	pair	5/–
PPL2	Parallel points, left		


BB1 STRAIGHT BRAKE RAIL

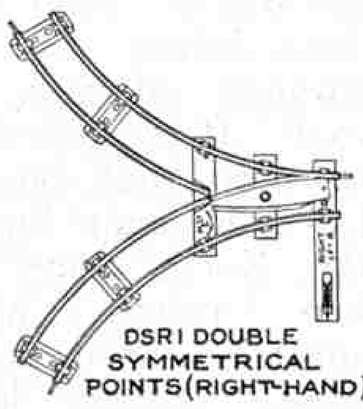
STRAIGHT RAILS

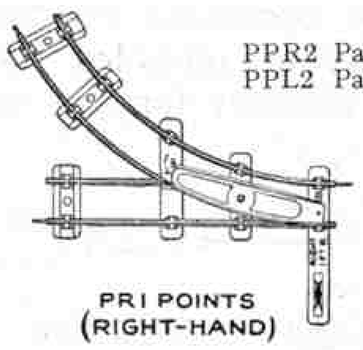
BM	Straight rails (for M0 Trains) ...	doz.		2/9
B1	Straight rails	„		4/–
B½	Straight half rails	„		3/–
B¼	Straight quarter rails	„		2/6
BB1	Straight brake rails	each		5d.
BBR	Straight brake and reverse rails	„		1/6
DS1	Straight rails, double track ...	½ doz.		6/6

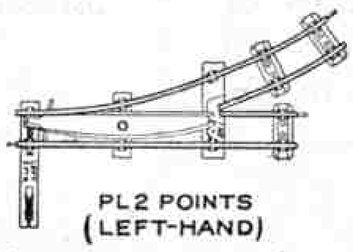

COR2 CROSSOVER POINTS

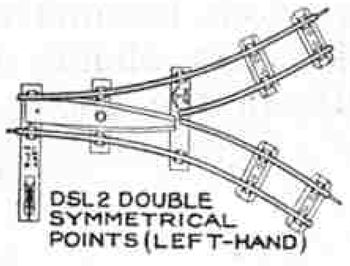
CROSSOVER POINTS

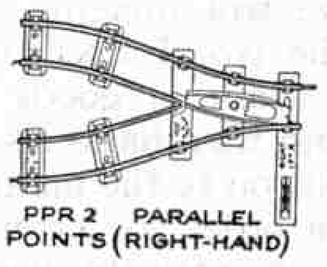
COR2	Crossover points, right-hand	per pair	12/–
COL2	Crossover points, left-hand		


DSR1 DOUBLE SYMMETRICAL POINTS (RIGHT-HAND)

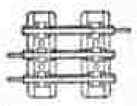

PR1 POINTS (RIGHT-HAND)

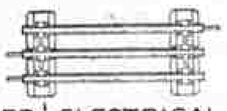

PL2 POINTS (LEFT-HAND)

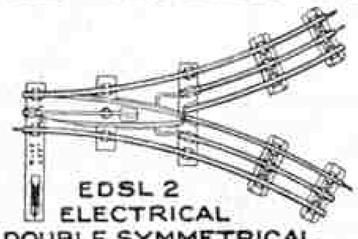

DSL2 DOUBLE SYMMETRICAL POINTS (LEFT-HAND)

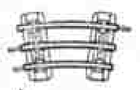

PPR2 PARALLEL POINTS (RIGHT-HAND)

Rails for Electric Trains

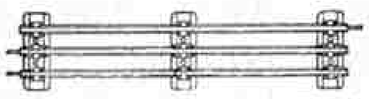

EB¼ ELECTRICAL STRAIGHT QUARTER RAIL


EB½ ELECTRICAL STRAIGHT HALF RAIL


EDSL2 ELECTRICAL DOUBLE SYMMETRICAL POINTS (LEFT-HAND)

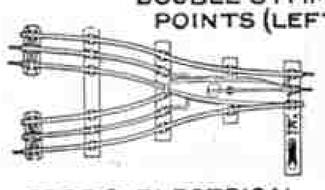

EA1¼ ELECTRICAL CURVED QUARTER RAIL

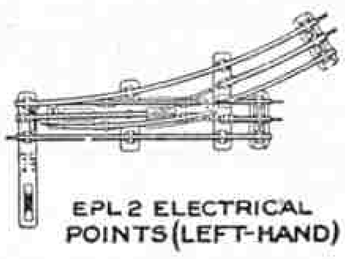
EA1½ ELECTRICAL CURVED HALF RAIL

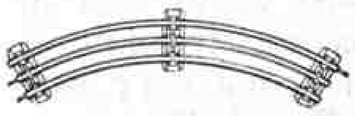

EB1 ELECTRICAL STRAIGHT RAIL

STRAIGHT RAILS

EB1	Straight rails	doz.		6/–
EB½	Straight half rails	„		4/6
EB¼	Straight quarter rails	„		4/–
EDS1	Straight rail, double track ...	½ doz.		8/6


EPPR2 ELECTRICAL PARALLEL POINTS (RIGHT-HAND)


EPL2 ELECTRICAL POINTS (LEFT-HAND)


EA1 ELECTRICAL CURVED RAIL

POINTS

For 2-ft. radius curves

EPR2	Points, right-hand	pair	7/6
EPL2	Points, left-hand		

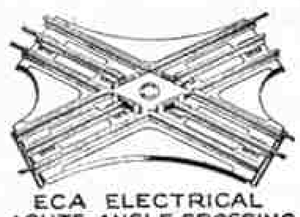
DOUBLE SYMMETRICAL POINTS

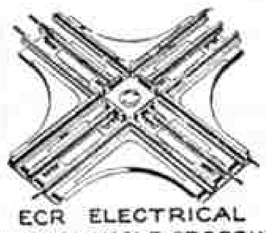
For 2-ft. radius curves

EDSR2	Double symmetrical points, right	pair	8/6
EDSL2	Do., do., left		

PARALLEL POINTS

EPPR2	Parallel points, right	pair	8/6
EPPL2	Parallel points, left		


ECA ELECTRICAL ACUTE-ANGLE CROSSING


ECR ELECTRICAL RIGHT-ANGLE CROSSING

CROSSINGS

ECA	Acute-angle crossings	each		4/–
ECR	Right-angle crossings	„		4/–

CURVED RAILS

EA1	Curved rails (1-ft. radius) ...	doz.		6/6
EA1½	Curved half rails „ ...	„		4/6
EA1¼	Curved quarter rails „ ...	„		4/–
EA2	Curved rails (2-ft. radius) ...	„		6/6
EA2½	Curved half rails „ ...	„		4/6
EA2¼	Curved quarter rails „ ...	„		4/–
EDC2	Curved rails, double track (2-ft. radius)	½ doz.		9/–

Electrical Points and Crossings for 1-ft. radius curves are not supplied.

TCPL Terminal Connecting Plates (low voltage) ... each 1/6

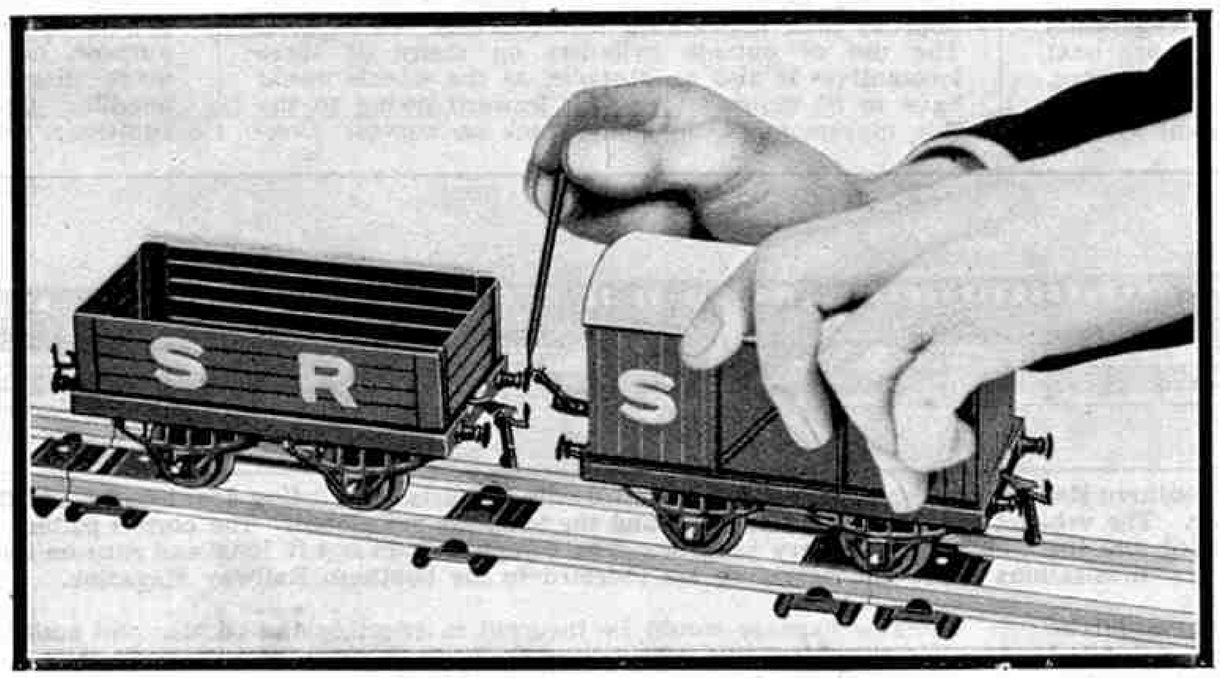
Manufactured by MECCANO LIMITED, OLD SWAN, LIVERPOOL

A Talk on Tarpaulins

By "Tommy Dodd"

ONE evening recently I was sitting in a station on an important main line when there passed through an immense goods train with almost every wagon carefully shrouded in a tarpaulin sheet. This set me thinking of the important part these sheets play in the everyday life of a railway, and I decided that the subject would be an interesting one to discuss this month.

Tarpaulin sheets are used mainly for covering wagons containing bales of wool, hides, lime, cement, and other loads that must be kept dry. It is not worth while covering such materials as coal, sand, and gravel, for such loads can take care of themselves. The sheets have also other but less important duties to perform. For instance, one may see wagons loaded with barrels covered with a tarpaulin, but in this and other similar cases the object of the sheet is merely to hold the goods together and prevent them from falling off.

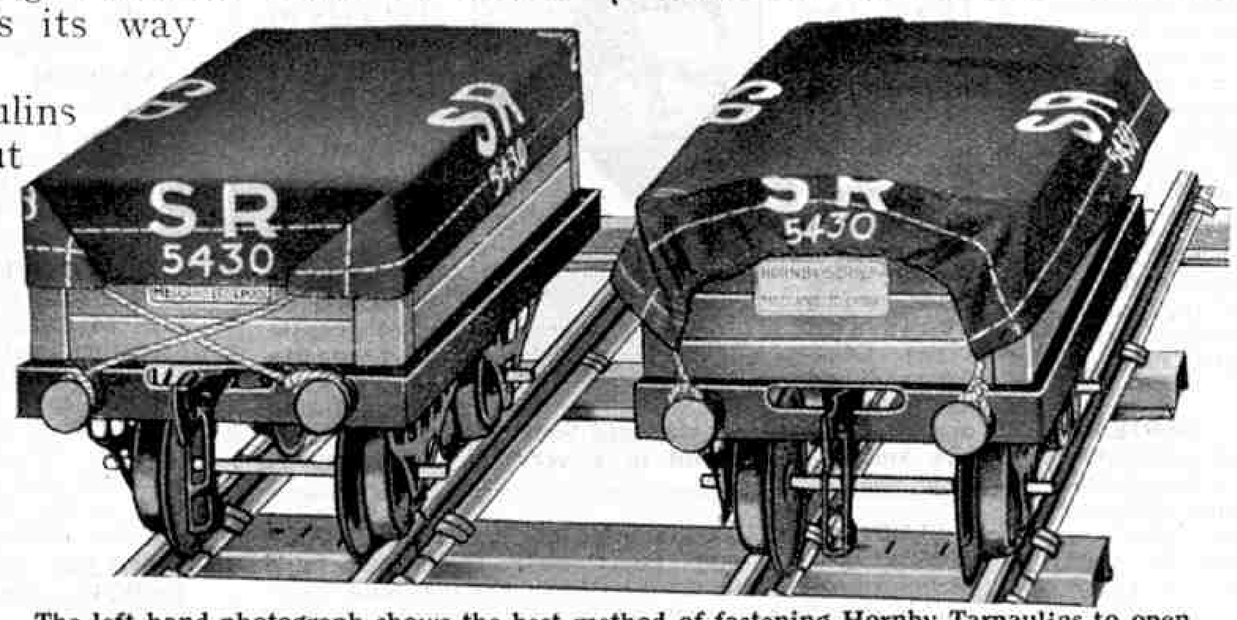


The Hornby Shunter's Pole in use. This pole makes it easy to carry out coupling operations in a railway-like manner.

Tarpaulins are not confined entirely to open wagons, but are sometimes seen also on covered vans. At first sight this appears a useless arrangement, but the explanation is simple. Many closed railway vans are fitted with a sliding door in the roof that facilitates the lowering of goods from a height immediately into the van. When such vans are carrying goods that must be protected from the wet, a tarpaulin sheet is placed over the top sliding door, in order to make certain that no rain finds its way into the van.

Wagons fitted with tarpaulins usually have a high load, but this is not always the case. For instance, tiles that must be kept dry are not stacked above the sides, but are carried in one or two layers only, and do not reach to the top of the wagon sides.

The Hornby Tarpaulin Sheets are extremely effective accessories, and if neatly fitted look very realistic. They are fitted with looped strings at each corner to enable them to be secured by passing the loops over the buffers. They are finished in black, and are neatly lettered and numbered in accordance with the practice of the four railway groups. It is, of course, not necessary that Hornby open wagons to be fitted with tarpaulins should carry an actual load. Indeed, a better effect is often obtained by packing a wagon tightly with paper to the required size, and then fastening the sheet over the whole.



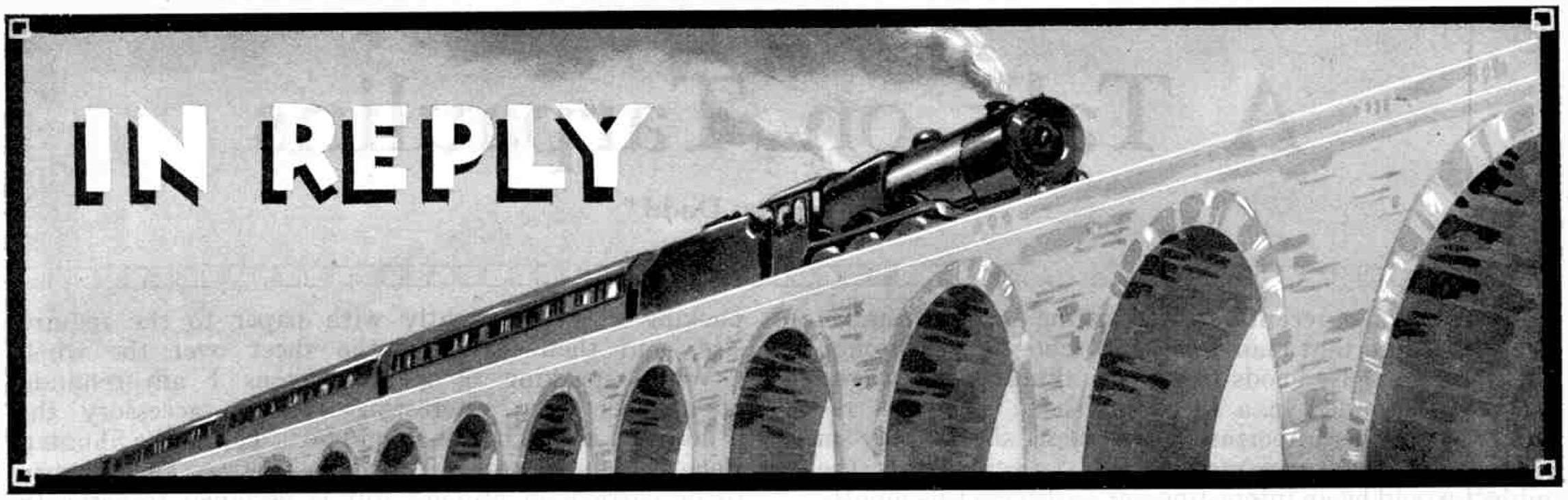
The left-hand photograph shows the best method of fastening Hornby Tarpaulins to open wagons. The neat result obtained by crossing the cords is emphasised by the right-hand photograph, which shows the inferior effect with uncrossed cords.

While speaking of goods wagons I am reminded of another very interesting Hornby accessory that is not used as much as it should be. This is the Shunter's Pole, which is not intended merely as an ornament to be carried on wagons, but is designed to serve the useful purpose of simplifying the operations of coupling and uncoupling Hornby vehicles. Some model railway owners apparently have the idea that the links of Hornby couplings can be manipulated more easily by hand than with the Shunter's Pole. This is a mistake, however, for after a little practice with the pole, coupling and uncoupling can be carried out with the greatest rapidity. In addition, coupling operations carried out by means of the pole have a far more railway-like appearance than if they are done by hand.

The Hornby Shunter's Pole is an exact replica of the real pole. It is about 4 in. in length, and is finished in black and fitted with a hook of the proper type. The method of employing it is shown in the accompanying illustration.

Coupling operations on real railways demand a large amount of skill, and in order to create more interest, and make the men more efficient by means of healthy rivalry, the various divisions of the railway companies hold coupling contests specially for shunters and goods guards. In a contest of this kind the competitor who succeeds in coupling and uncoupling the largest number of wagons in a given time is awarded a much-coveted prize, which usually takes the form of a shield or cup. In this way the skill of the men concerned is encouraged and this makes for the speedy working necessary nowadays when road competition for traffic is so keen.

As long as the usual British form of coupling is retained there will be need for the use of the shunter's pole. Automatic couplers are used a great deal abroad, the vehicles coupling on impact; but they are not yet applied to goods stock in this country and only to a limited extent for passenger vehicles.



WAGONS LETTERED M.E.T.—As the Metropolitan Railway do not possess a large number of trucks, we doubt if there would be sufficient demand to warrant their inclusion in the Hornby Series. Your suggestion will be kept in mind, however, when we are next making alterations and additions to our wagons. We agree that Metropolitan trucks are sometimes seen in places far remote from their parent system, and that their use would give additional realism to almost any model railway. (*Reply to R. H. Jones, Tottenham*).

SHUNTING SIGNALS. — It is true that many special varieties of shunting signals are employed by the different railways, and their reproduction on a miniature system would be realistic. At the same time there is only a limited scope for special-purpose signals on most layouts, for shunting movements are usually performed as required without the use of signals. (*Reply to M. Burtenshaw, Mayfield*).

TANK WAGON LETTERED R.O.P.—There are already available in the Hornby Series tank wagons for the carriage of four of the leading brands of petrol, and therefore we do not propose to add to the number at the moment. It is doubtful also whether a wagon lettered as you suggest would prove generally popular. (*Reply to N. Hart, Cardiff*).

ROUNDHOUSE TYPE OF LOCOMOTIVE SHED.—Owing to the large amount of space that would be required for a model locomotive shed of this type, we do not think that there would be a sufficient demand for it. It would also be a costly accessory, and for this reason would not be popular with the majority of Hornby Railway owners. (*Reply to H. W. Cross, Maidstone*).

MINIATURE EMBANKMENTS. — Embankments give an extremely realistic appearance to any layout, but owing to the varying conditions of model railways, Hornby Train owners usually prefer to construct these for themselves. We doubt, therefore, if such a feature would prove popular if introduced into the Series, but we will bear your idea in mind when revisions are being made. (*Reply to R. Whittaker, Liverpool*).

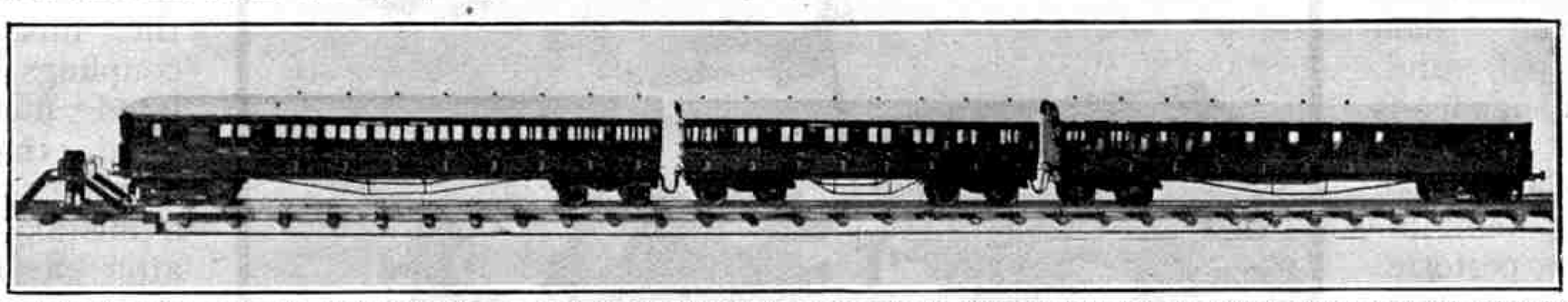
LAMPS ON BUFFER STOPS.—The addition of a red lamp on Hornby buffer stops would certainly give these accessories a more realistic appearance. Your suggestion will be carefuly considered when revisions to our accessories are next taken in hand. (*Reply to N. W. Huntley, Hove*).

TANK LOCOMOTIVES IN THE "M" SERIES.—The suggestion for the inclusion of a tank locomotive in this series is interesting, and such a locomotive would probably prove popular. Your proposal therefore will have careful consideration. The new M1 reversing mechanism would of course be used, and a very satisfactory locomotive should result. (*Reply to R. Leadbetter, Birmingham*).

ADDITIONAL LETTERING AND NUMBERING ON HORNBY WAGONS.—Your suggestion is interesting, and there is no doubt that a realistic appearance would be given by the addition of further lettering on our wagons. The reproduction of additional detail is under consideration at the moment. (*Reply to D. H. Perrett, Harrogate*).

PRIVATE OWNERS' COAL WAGONS.—We agree that the inclusion of this type of wagon would prove realistic on a miniature railway, as coal trains seen in actual practice are frequently formed almost exclusively of such trucks. This suggestion has been made before, and is at present receiving careful consideration. (*Reply to H. Waring, Mexborough*).

LEADING PONY TRUCK FOR 0-4-0 LOCOMOTIVES.—The addition of a pony truck to the various 4-wheeled locomotives in the Series would hardly improve their appearance to the extent you suggest. The use of outside cylinders on many of these locomotives is also an obstacle, as the wheels would have to be mounted very far forward owing to the side movement of the pony truck on curves. Considerable expense would be incurred in effecting the alteration, and this would necessitate an increase of price. (*Reply to K. Collins, Wolverhampton*).



A splendid miniature Southern Railway three-coach electric train fitted with full details including door handles and the correct head codes as used on the railway. The vehicles are constructed of wood and the windows are glazed. The correct pattern connections between the coaches are provided and the whole effect is very realistic. The complete train is 4 ft. long and runs on Gauge 0 rails. For the illustrations above and below we are indebted to the Southern Railway Magazine.

SLIP COACH APPARATUS.—We agree that the practice of slipping coaches from express trains is a fascinating one, and is especially so on a miniature railway. We have been experimenting for some time with various forms of slip mechanism, but no definite decision has as yet been reached. (*Reply to A. Foster, Swindon*).

A Fine Model and its Builder

G. L. Blay of Eastleigh, the maker of the train shown above for which he was awarded a diploma and prize at "The Model Engineer" Exhibition in September last year.

The faithfulness of the model to the original is all the more remarkable when it is remembered that the details of the coaches were memorised by him from his observations when he lived at Wimbledon in the district served by these trains.

Although only 14 years of age, Blay has finished off the train in splendid style, for the interior is fitted with upholstered seats and photographic views. Compartments for guard and motorman are included. The lining and lettering follows standard Southern Railway practice and is carried out in a very effective manner.

SLOPING TANKS ON GREAT WESTERN LOCOMOTIVES.—As you point out numerous tank locomotives on the G.W.R. have sloping tank tops, which give them a very distinctive appearance. The resemblance of Hornby tank locomotives to G.W.R. prototypes would of course be increased by such a feature, but the alterations necessary would result in an increase of price and thus the popularity of the locomotives concerned would suffer. We will keep the scheme before us, however. (*Reply to I. F. Wray, Gt. Bedwyn*).

TARPAULIN SHEETS.—Miniature tarpaulin sheets are already included among the Hornby Accessories. The sheets are lettered and numbered in the styles of the four railway groups, and are fitted with strings for securing to the Hornby wagons. They are sold at 3d. each, and are obtainable from any Hornby Train or Meccano dealer. (*Reply to E. Brownley, Oxford*).

SCREW-DOWN HAND BRAKE FOR TENDERS.—The provision of such a brake on our tenders would of course follow actual practice, and would be an attractive addition. It would serve no really useful purpose, however, and the parts would have to be made disproportionately robust to withstand the handling that they would have to undergo. In addition, the cost of Hornby tenders would be considerably increased by the addition of such a fitting. (*Reply to R. D. Mason, Sheffield*).

BANANA VANS.—We agree that there would probably be a good demand for vans of this type in the Hornby Series, as they may be seen in large numbers in real practice. For the time being we advise you to use either the No. 1 or No. 2 Luggage Van already included in the Series. We are considering the introduction of special traffic vans of the kind you propose. (*Reply to J. Hudson, Exeter*).

MINIATURE MERCHANDISE. — The suggestion for miniature goods such as bales, crates, boxes, barrels, etc., has been made on many previous occasions, and as we have already stated, is under consideration. There are already in the Hornby Series miniature travelling cases and trunks. (*Reply to G. E. Wrodden, Liverpool*).

S.R. LOCOMOTIVE HEAD CODE DISCS.—Head code discs as used on the S.R. have been asked for before by S.R. enthusiasts, and we have no doubt that their introduction would be popular, even with Hornby Train owners who do not live in S.R. districts. The idea is under consideration. (*Reply to K. F. Ramsay, Eastbourne*).

SPRING BUFFERS ON LOCOMOTIVES.—Spring buffers on model railway locomotives are not effective for a variety of reasons. At the same time they are costly to produce, and therefore we cannot consider their introduction. (*Reply to H. Middleton, Bradford*).

VACUUM BRAKE CONNECTIONS. — Dummy vacuum brake connections to be fitted to the Pullman coaches, as on the No. 2 Special Locomotives, would not effect any great improvement in appearance, as they would be practically hidden by the corridor connection. They would also add appreciably to the cost. (*Reply to P. G. Smith, Wrexham*).

ROAD OVERBRIDGE.—The provision of bridges of this kind helps greatly in giving realistic surroundings to miniature railways. The designs of these structures vary considerably and we think it better for enthusiasts to construct them for themselves, for they may fit them into awkward situations on the layout in which bridges of standard design would be useless. Wood or cardboard may be used in bridge-building and details have been given from time to time in the H.R.C. pages of the "*M.M.*". (*Reply to V. Hill, Whitby*).

SHEER LEGS FOR HORNBY LOCOMOTIVE DEPOTS.—These would prove useful for lifting Hornby locomotives, and would look extremely realistic if placed near the locomotive shed, where they are often seen in real practice. In view of the ease with which such fittings may be made with Meccano, however, we do not consider it advisable to introduce them into the Hornby System. (*Reply to T. Hawthorn, Scarborough*).

SMOKEBOX DOOR NUMBER PLATES FOR L.M.S. LOCOMOTIVES.—The majority of L.M.S. locomotives carry a small number plate on the smokebox door, and the addition of this feature in miniature practice would certainly be realistic. A number is already transferred on the door of the L.M.S. No. 2 Special locomotive, and we will consider the addition of the same feature on other locomotives. (*Reply to E. Bury, Watford*).

LARGER TENDERS FOR No. 1 SPECIAL LOCOMOTIVE.—We doubt if a larger tender, such as you suggest for these locomotives, would prove popular with the majority of Hornby Train enthusiasts. The appearance of the engine would be somewhat spoilt by the tender being too large. However, if you specially require it you might obtain a No. 2 Special Tender of whichever pattern is most suitable, and use this in conjunction with your locomotive. (*Reply to K. H. Smith, Spital*).

LONGER STRAIGHT RAILS.—Numerous suggestions have been received that the length of Hornby straight rails should be increased. As you point out, the reduction of the number of rail joints would result in smoother running and the noise of the wheel beats would also be more realistic. Your suggestion will be considered in due course. (*Reply to R. Burton, Northwich*).

TELEPHONE KIOSK.—The addition of this accessory to the Hornby Series would enable the appearance of stations to be improved and probably it would be popular. The idea will be considered. (*Reply to R. Harvey, Norwich*).

TAIL LAMP BRACKETS ON COMPOSITE COACHES AND BRAKE VANS.—A number of requests have been received that we should provide lamp brackets on composite coaches and brake vans. The addition of these would enable a tail lamp to be correctly displayed at the end of each train, and the realistic effect would be considerably improved thereby. This matter is at present receiving attention. (*Reply to J. Dingwall, Cork, and others*).

LARGER KEY SHAFT FOR HORNBY LOCOMOTIVES.—We were surprised to receive your suggestion that the key shafts of Hornby locomotives should be made larger. We have not experienced any difficulty owing to these wearing unduly, as the material of which they are made is specially tough. If your locomotive is unsatisfactory in this respect it can, of course, be attended to by our Service Department, to whom it should be returned. (*Reply to C. E. Holdsworth, Southampton*).

NEW TYPE OF SNOW PLOUGH.—We were interested in your suggestion for a more simple type of snow plough. Possibly the wedge-shaped plough that is fixed to the front of the locomotive would prove popular on a Hornby Railway, and it would certainly be an interesting accessory. As this type of plough is generally used in this country, the idea is being filed for consideration. (*Reply to D. Kirkby, Derby, and V. Miller, Durham*).

EXTENDIBLE ENGINE SHEDS.—It is certainly difficult to accommodate a number of locomotives in an engine shed on a layout, and we were interested, therefore in your ingenious suggestion that Hornby Engine Sheds should be available in sections so that, as additions to the locomotive stock were made, the Engine Shed might be extended accordingly. The price of such sectional sheds would probably be high, but your idea will have consideration. (*Reply to F. Smythe, Darlington*).

INSIDE CYLINDER 4-4-0 LOCOMOTIVE.—Although the majority of the locomotives in the Special Series have outside cylinders, you are evidently unaware that the Southern Railway "L1" engine is an inside cylinder type. (*Reply to J. Holt, Stoke*).

PULLMAN OBSERVATION CAR.—No doubt the reproduction of a vehicle of this kind would be attractive on a Hornby Railway, but there is only one Pullman Observation Car in operation on British Railways. This is in service on the Oban section of the L.M.S.R. As the popularity of a model of a car that is so little used in actual practice is doubtful, we regret that we cannot adopt your suggestion. (*Reply to F. H. Hudson, Peterborough*).

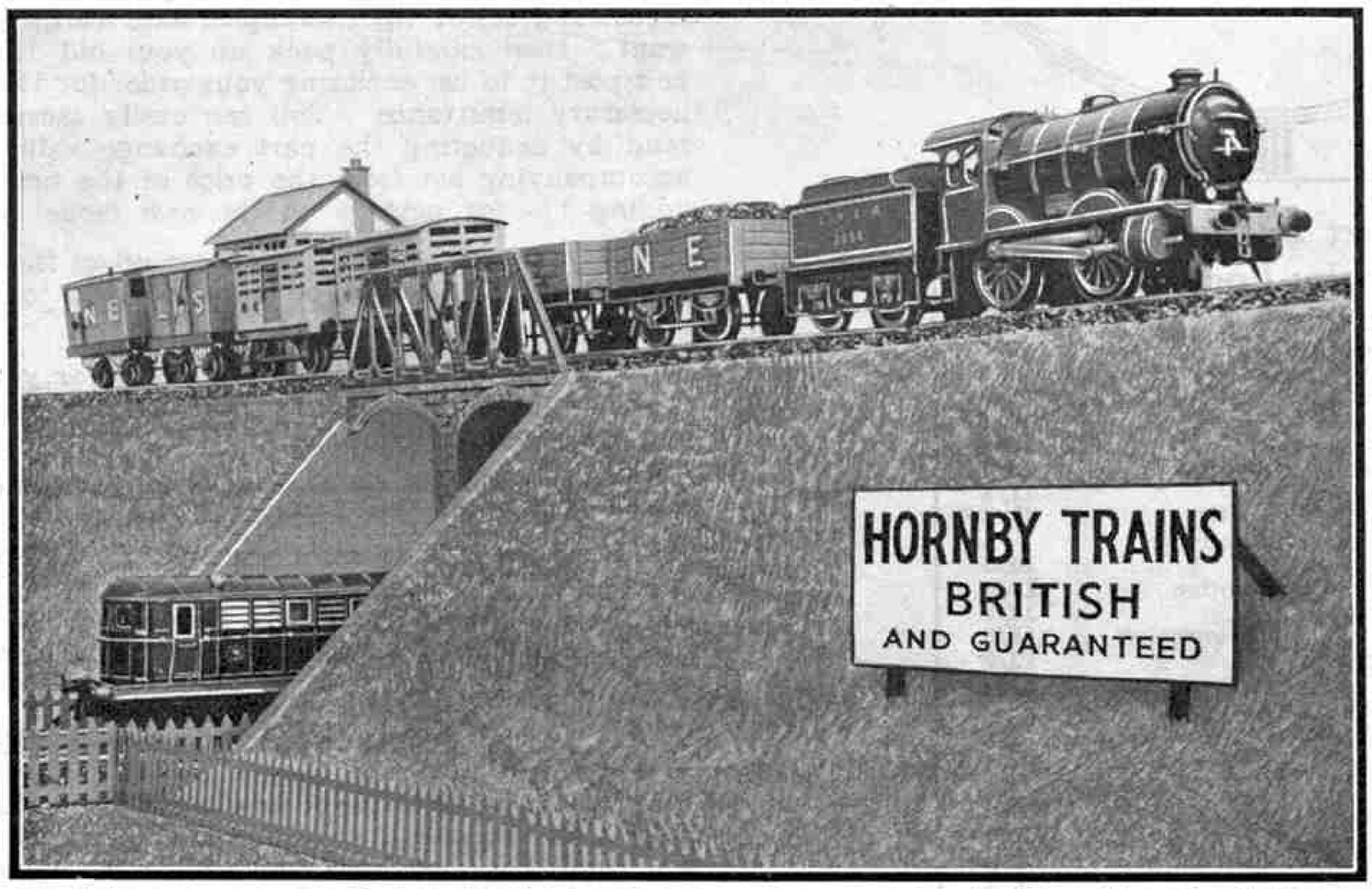
BOGIE PARCEL VAN.—Special vans for the conveyance of parcel traffic are, as you suggest, extensively used on our railways, and probably a miniature reproduction of such a vehicle would be popular. There are several attractive prototypes running, and when revisions of our rolling stock next occur we shall possibly consider the claims of these. Meanwhile we suggest that you use the No. 2 Luggage Van, which should be quite satisfactory for the purpose. (*Reply to L. Matthews, York*).

0-6-0 GOODS LOCOMOTIVE.—As no suitable mechanism is as yet available in the Series we cannot consider such an engine as you propose. (*Reply to A. Potter, Sheffield*).

HORNBY FISH VAN.—We agree that large numbers of these vehicles are employed by our railways, and frequently trains composed exclusively of them are seen. We have received a number of demands for this item of rolling stock, and its introduction is receiving attention. These remarks also apply to Banana Vans and special-purpose vans of similar types. (*Reply to M. Burrows, Leicester*).

MINIATURE COAL STACKS.—We do not propose to introduce miniature coal stacks into the Hornby Series. These accessories may be readily constructed at home by gluing pieces of washed coal on to an inverted cardboard box. The top edges of such a stack should be painted white to represent the white-wash of the originals. An advantage of this method is that the stack may be made to the exact size required for the particular layout. (*Reply to W. Taylor, Wolverhampton*).

MODEL OVERSEAS LOCOMOTIVE.—Although we are interested in your idea, it is doubted whether the locomotives you suggest would prove popular enough to warrant the expense of manufacture. If we receive further requests for such locomotives the idea will probably be given consideration. (*Reply to B. Barber, Nottingham*).



A typical scene on a Hornby Railway showing a goods train passing over a viaduct while a Metropolitan Train runs below. The centre section of the Hornby Viaduct is a useful accessory for spanning gaps as shown here, and adds a realistic atmosphere to the layout.

CAB FITTINGS FOR HORNBY ENGINES.—We agree that cab fittings would make Hornby engines more realistic, but the cost of reproducing fine detail of this kind would be very great. The cabs of the No. 2 Special locomotives have a certain amount of detail shown on the boiler backplate. If other details are really desired they can be fitted in by the owner himself. (*Reply to H. Bonner, Leicester*).

PITS IN ENGINE SHEDS.—This is a novel idea, but is practically impossible to carry out owing to the fact that the floor of the engine shed would have to be elevated so as to allow for the depth of the pits. It is doubtful whether there would be any great demand for such sheds, as they would only be ornamental and no useful purpose would be attained. (*Reply to C. Williams, Manchester*).

IMPROVED CRANE TRUCK.—Your suggestion that the cranes mounted on the Crane Truck and Breakdown Van should be made with a movable jib is interesting, and would no doubt prove attractive. We agree that this improvement would greatly widen the scope of their employment, but the chief objection is the cost entailed in the alteration of our present cranes. The idea is being kept before us for attention at a later date. (*Reply to J. Hailey, Hull*).

SALT WAGON.—As we have previously pointed out, wagons of this type are only seen in particular districts of the country, so that their general popularity as models is rather doubtful. Your suggestion that we should use the existing Cement Wagon appropriately painted and lettered is interesting, and would be a fairly cheap method of meeting your demand. The suggestion cannot be adopted at the moment, however. (*Reply to S. G. Barton, Macclesfield*).

MINIATURE MECHANICAL LUBRICATORS FOR HORNBY No. 2 SPECIAL LOCOMOTIVES.—The addition of dummy lubricators would certainly enhance the appearance of the No. 2 Special locomotives. A lubricator of this kind is a characteristic fitting on the majority of modern locomotives, being frequently mounted in a prominent position on the running plate. We will therefore keep your suggestion in mind when revisions are being made. (*Reply to E. O'Henry, St. Ives*).

ELECTRICALLY OPERATED SIGNALS.—Signals operated by solenoids would, of course, be attractive, especially on an electric railway where complete control of all operations would thus be possible from one central point. The objection to their introduction in the Series is that they would necessarily be expensive. It should be noted that the necessary mechanism may be arranged using standard Meccano parts, and it has been previously dealt with in these pages. We cannot therefore give further attention to this suggestion at the moment. (*Reply to N. J. Smith, Sunderland*).

TRAIN FERRY GOODS VEHICLES.—Miniature wagons representing the vehicles used on the Harwich train ferry would make an extremely interesting addition, but it is doubtful whether these are sufficiently known among Hornby Railway enthusiasts generally to justify their introduction. (*Reply to S. Ashton, Peterborough*).

SIDE DOORS FOR LOCOMOTIVE CABS.—The provision of these doors for locomotive cabs would certainly be an interesting addition, and the appearance of a locomotive would be generally neater as a result. While such doors might be provided on tank locomotives, it would hardly be possible for them to be fitted to tender locomotives also as is done in real practice, owing to difficulties caused by the relatively sharp curves that a miniature locomotive has to negotiate. (*Reply to T. E. Ellis, Colchester*).

NAMEBOARDS FOR PULLMAN CARS.—Numerous suggestions have been received for us to include in the Series suitable destination boards for use on our Pullman Coaches. You will no doubt be pleased to hear that this matter is at present receiving attention, and we hope to be able to make an announcement in these pages shortly. (*Reply to H. Long, Halifax*).

UPPER QUADRANT SIGNALS.—This pattern of signal is becoming more generally used on British Railways and would probably prove popular among Hornby Train owners. As colour light signals are being extensively used at the same time, however, and may possibly become standard, we think that the majority of enthusiasts would prefer these. We are therefore not likely to introduce upper quadrant signals. (*Reply to W. Meadows, Manchester*).

MORE ELABORATE SIGNAL GANTRY.—Although we agree that a gantry containing more signals than our present pattern would be attractive and realistic, we are not able at the moment to consider your suggestion. Where complicated gantries are necessary on a miniature layout, model railway owners invariably construct them themselves to suit the particular conditions obtaining. (*Reply to J. W. Gardner, Liverpool*).

MINIATURE POSTERS.—Several suggestions have been received for miniature posters to be introduced in the Hornby Series. We agree that if they were printed on gummed paper it would be possible for them to be fixed in any part of the station, retaining walls, or miniature hoardings as required. Careful attention will be given to your idea, and if any definite decision is reached an announcement will be made in some future issue. (*Reply to J. Waite, Bolton*).

BOGIE TENDER FOR "LORD NELSON" LOCOMOTIVE.—We are aware that large bogie tenders are employed on many Southern Railway express locomotives, and that these, if reproduced in miniature, would be very fine models. At the same time smaller six-wheeled tenders are also used for the locomotives engaged on short distance duties, such as the Dover Pullman trains, and this is the pattern that is modelled in the Hornby Series. (*Reply to J. Walker, Ashford*).

G.W.R. BOGIE WELL WAGON.—A true-to-type reproduction of a G.W.R. Bogie Well Wagon would no doubt be popular among enthusiasts who favour that railway. Owing to the special nature of these vehicles, however, the expense involved in their production would be heavy and their popularity would be affected by the consequently high price. (*Reply to J. Brown, Bath*).

MECHANICAL WAGON TIPPLER AND COALING APPARATUS.—Coaling plant of this description is becoming more generally used at locomotive depots in this country, and particulars of several installations have appeared in the "*M.M.*" Such an accessory for the Hornby Series would be interesting, but very costly; and we suggest therefore that Meccano parts should be used in order to reproduce this equipment for a miniature line. The construction of a Wagon Tippler was described in the June 1929 issue. (*Reply to G. Beasley, Leeds*).

Hornby No. 1 Special Locomotive

BOYS! Here is a plan to secure one of the magnificent new Hornby Locomotives

You have probably been using a Hornby Locomotive for some years and would like to own one of the fine new models that now figure in the Hornby Catalogues. The object of the new Hornby Locomotive Part Exchange Scheme is to help you to do this.

First of all, carefully study the latest Hornby Train Catalogue, and select the new up-to-date Hornby Locomotive you want; then carefully pack up your old Hornby Locomotive and post it to us, enclosing your order for the new one and the necessary remittance. You can easily ascertain how much to send by deducting the part exchange value indicated in the accompanying list from the price of the new Locomotive, and adding 1/– for postage on the new model you purchase.

If you prefer to do so, you can effect the exchange through your dealer, who will be very pleased to give you all the information you require.

The allowance that will be made for your old locomotive is shown in the list of Part Exchange Values of Hornby Locomotives given on this page.

No matter what the age or condition of your old Locomotive is, you can exchange it under our "Part Exchange" plan.

If you decide to send your old Locomotive to us address your parcel to "Special Service Department, Meccano Limited, Old Swan, Liverpool," and be sure to enclose with it your own name and address written in plain characters.

List of Part Exchange Values of Hornby Locomotives

CURRENT TYPES	
M1/2 Locomotive No. 3031	2/3
No. 0 Locomotive	5/3
No. 1 Tank Locomotive	6/3
No. 1 Locomotive	6/3
No. 1 Special Locomotive	8/3
No. 1 Special Tank Locomotive	8/3
No. 2 Special Locomotive	11/3
No. 2 Special Tank Locomotive	11/3
No. 1 Electric Tank Locomotive, Permanent Magnet	16/3
No. 2 Electric Tank Locomotive	18/9
No. 3E Locomotive	18/9
No. 3E Riviera "Blue" Locomotive	18/9
No. 3C Locomotive	13/9
No. 3C Riviera "Blue" Locomotive	13/9
Metropolitan C Locomotive	11/3
Metropolitan L.V. Locomotive	23/9
OBSOLETE TYPES	
George V Locomotive / No. 00 Locomotive (These models were identical)	3/3
M3 Locomotive	4/3
Zulu Locomotive	5/3
Zulu Tank Locomotive	6/3
No. 2 Locomotive	10/–
No. 2 Tank Locomotive	11/3
Metropolitan H.V. Locomotive	26/3
No. 1 Locomotive, fitted for Hornby Control	7/6
No. 1 Tank Locomotive, fitted for Hornby Control	7/6
No. 2 Locomotive, fitted for Hornby Control	11/3
No. 2 Tank Locomotive, fitted for Hornby Control	12/6

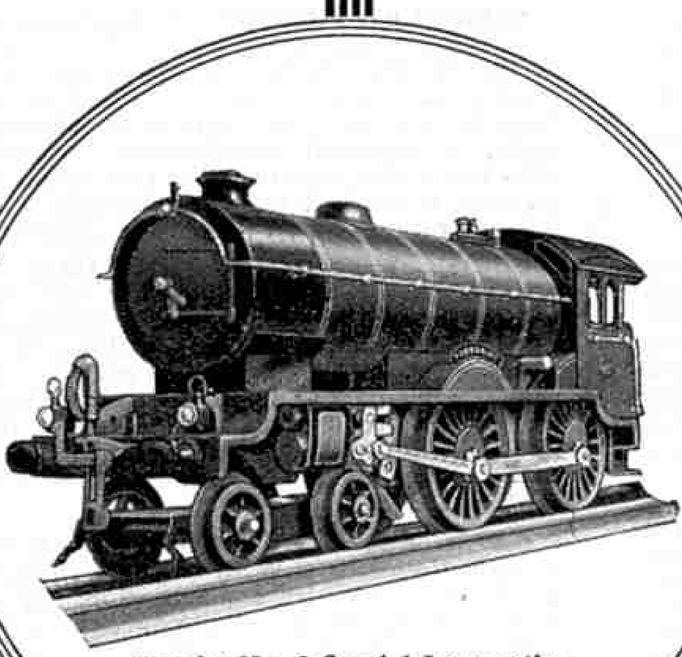
How the plan works

Here is an example of how the plan works. Assuming you have a No. 1 Tank Locomotive that you wish to exchange, you see from the list that its exchange value is 6/3. You then look at the Hornby Train catalogue and choose one of the new Locomotives, the cost of which is not less than 12/6 (or, in other words, not less than double the Part Exchange value of your No. 1 Tank Locomotive).

Say that you decide to have a No. 2 Special Tank, the price of which is 25/–. Pack up your old No. 1 Tank and deduct 6/3 from 25/– (the price of the new No. 2 Special Tank) enclose a remittance for 18/9 plus 1/– carriage on the new Locomotive—19/9 in all. Send the Locomotive and the remittance to Meccano Limited, Liverpool.

Alternatively, you can take your old No. 1 Tank Locomotive to your dealer with a remittance for 18/9, and he will give you the new No. 2 Special Tank Locomotive that you require.

IMPORTANT.—The Hornby Locomotive Part Exchange Scheme is not applicable to any country outside Great Britain.



Hornby No. 2 Special Locomotive

HORNBY TRAINS

MECCANO LTD., OLD SWAN, LIVERPOOL

H.R.C. COMPETITION PAGE

A Railway "Word-Finding" Contest

THE interest that continues to be taken by H.R.C. members in the railway problems that are set before them month by month on this page shows no sign of diminishing, and indeed is certainly increasing. A careful record is kept of the entries to each competition, and these records show that the most popular contests are those which give members an opportunity of combining their knowledge of railway working and railway mechanisms with their ingenuity and general knowledge. The most popular of all competitions have been those involving word-building or word-finding problems, and this month we announce another contest of this type.

In the centre of this page is a panel containing, on the left, a column of dashes and crosses. Each of these mysterious signs represents the letter of a word and, as will be noticed from the list of clues contained in the right-hand column, every one of the hidden words relates in some way to railway matters. In each case the total number of dashes and crosses is the same as the total number of letters in the hidden word, each dash representing a consonant and each cross a vowel. Each of the hidden words is one that should be quite familiar to every member of the Hornby Railway Company.

No attempt should be made to solve the contest on this page of the magazine. The list of dashes and crosses should be copied out on to a sheet of paper, and then worked out item by item with reference to the clues. When as many as possible of the hidden words have been found, the competitor's name, address and membership number should be written clearly on the sheet, and this should then be placed in an envelope and sent to Headquarters, marked "H.R.C. Word-finding Contest," in the top left-hand corner.

It should be remembered that the omission of the H.R.C. membership number from any entry will cause it to be disqualified immediately.

The competition will be divided into two sections—Home and Overseas. Prizes of Hornby goods (or Meccano if preferred) to the value of £1-1s., 15/–, 10/6 and 5/– respectively will be awarded to the four competitors in each section who submit the most complete lists. In addition a number of consolation prizes will be awarded to the best of the remaining entries. In the event of a tie for any prize, neatness and general arrangement of the entries will be taken into consideration.

Envelopes should be plainly addressed and should be posted to reach Headquarters at Binns Road, Old Swan, Liverpool, on or before 28th February. The closing date for the Overseas section is 30th May.

Can you discover the fifteen hidden railway terms, with the aid of the clues given in the right hand column?

Hidden Words	Clues
– – x – – x – x	The boiler produces this.
– – x x – – –	That which pays the dividends.
– x – x x – x	The daily journey.
– x – – x –	The passport.
– – x – x –	An adjunct to quick steaming.
x – – x – – – x –	A form of crank found in all engines.
– x – – x –	An artificial passage.
– – x – – – x	Sometimes called a "Rod."
– x – – – x x –	The meeting of the ways.
– x – – x x – –	Some engines are of this type.
– – x – – x – –	Seen at every big terminus.
– – – x – x – x	All railway operations conform to this.
x – – x – – x x – –	Most popular in the summer.
– x – x –	A place of deposit.
– – x – x –	Safety demands an alert—.

Railway Drawing Contest

Since this H.R.C. Competition Page was commenced we have held many drawing contests with locomotives or complete trains as their subject. There are, of course, many other interesting features of railways that provide suitable subjects for drawings, and this month we offer prizes for the best drawings of "*Any Railway Subject, other than a Locomotive or Train.*"

We make no restrictions of any kind in regard to the subject, leaving the choice entirely open to the competitor. There is a wide range of material to choose from, and some of this is within reach of every H.R.C. member, no matter where he lives. Engine sheds, signal cabins, turntables, level crossings, and a host of other familiar items afford ample scope for artistic ability and accurate reproduction.

To the competitors who submit the four best drawings in each of the two sections, Home and Overseas, will be awarded prizes of Hornby Trains, or Meccano products if preferred, to be chosen by the winners to the value of 15/–, 10/–, 5/– and 2/6 respectively.

Entries must bear the competitor's full name, address and H.R.C. membership number. Envelopes should be marked "H.R.C. Drawing" in the top left-hand corner, and be addressed to Meccano Ltd., Binns Road, Old Swan, Liverpool. Closing dates—Home Section, 28th February; Overseas Section, 30th May.

H.R.C. Competition Results

HOME

December "Mystery Locomotive" Contest.—First: R. G. Jennings (17345), Birmingham. Second: G. Hughes (7036), New Barnet, Herts. Third: D. Chapman (18274), Irby, Cheshire. Consolation Prizes: F. W. Byron (1347), Nottingham; S. Turner (13029), Macclesfield; W. A. Spurr (2161), Kegworth, Nr. Derby; L. Godfrey (3905), Penarth, Glam.; R. Mann (18111), Glossop; B. Hughes (14790), Weymouth; N. E. Sharp (19262), Loughton, Essex; J. Bryce (9070), Paisley.

December "Railway Symbols" Contest.—First: B. H. Bray (8259), Walton-on-Thames, Surrey; Second: B. H. Farmer (4777), Swindon, Wilts.; Third: K. H. Beales (14024), London, S.E.23.

December "Mail Train" Drawing Contest.—First: C. A. Brunt (10229), Leeds. Second: G. A. Nix (2993), Mickleover, Nr. Derby. Third: R. A. S. Musker (13162), Hightown, Nr. Liverpool. Fourth: E. W. Fry (12192), Salisbury, Wilts. Consolation Prizes: J. Lawry, London, N.W.10; A. Addie (17707), London, S.W.2; L. Martin (6922), Leicester; B. H. Bray (8259), Walton-on-Thames, Surrey; W. S. Harris (5708), Cardiff; J. J. Audas (17431), Gateshead, Co. Durham; H. Sutcliffe (20504), Preston, Lancs.; E. A. Smith (18407), Wirral, Cheshire.

OVERSEAS

September "Errors Contest No. 1."—First: Jan Hers (8270), Potchefstroom, S. Africa. Second: P. Nicholls (7880), Christchurch, New Zealand. Third: G. Holloway (14839), New Zealand. Fourth: F. Fitzgerald (16892), Sydney, Australia. Consolation Prizes: D. Menzies (9399), New Zealand; C. R. J. Pollard (11071), Natal, S. Africa; J. Wilks (14252), Kroonstad, S. Africa; R. A. Harvey (16554), Australia; A. Johnstone (16298), N.S.W., Australia; A. B. J. Reid (14843), Cape Town, S. Africa; W. Butler (17411), Cape Town, S. Africa; P. L. Bargellini (8388), Florence, Italy; G. Nicolson (17045), Johannesburg, S. Africa; R. G. Potter (13928), East London, S. Africa; R. Harman, N.S.W., Australia; N. G. Jackson (7331), Transvaal, S. Africa.

September "Holiday Essay."—First: P. N. Senji (18267), Madras, India. Second: B. C. Khambatta (8026), Broach, India. Third: F. Whyte (17289), Queensland, Australia. Fourth: T. Watson (18065), N.S.W., Australia. Consolation Prize: Walter Fagg (8557), Otago, New Zealand.

August "Locomotive Voting."—1. G. Mitsotakis (2921), Croix Rousse, Lyon, France; 2. F. R. M. Lawson (1575), Las Palmas, Grand Canary; 3. A. Brooks (16495), Nolantown, N.Z.; 4. R. A. Wragg (7913), Bandikui, Rajputana, India.

August "Railway Photograph."—1. M. P. Senji (18118), Madras; 2. J. Twohill (9960), Auckland, N.Z.; 3. T. MacLachlan (1965), Dunedin, N.Z.

With the Secretary

An Important Session

The delights of Christmas and New Year social gatherings have now come to an end and members have again settled down to ordinary club work. In many respects the coming session is the most important of the four into which the year is divided, for in it the greatest efforts to show interested friends the value of the work carried on by Meccano clubs are usually made. Most clubs take the opportunity of winding it up, and with it the activities of the indoor season, with an Exhibition or a Concert. This is a course of action that I strongly recommend, and the work carried on at the ordinary meetings should be so planned that a really impressive display may then be made.

Preparations for the Exhibition itself, on whatever scale this may be conducted, should be commenced as soon as possible. Work of this character has already begun in several clubs, and I am quite sure that this forethought will be rewarded by splendid gatherings at the Exhibitions to be held by these clubs shortly before Easter.

The Blue Triangle in Football

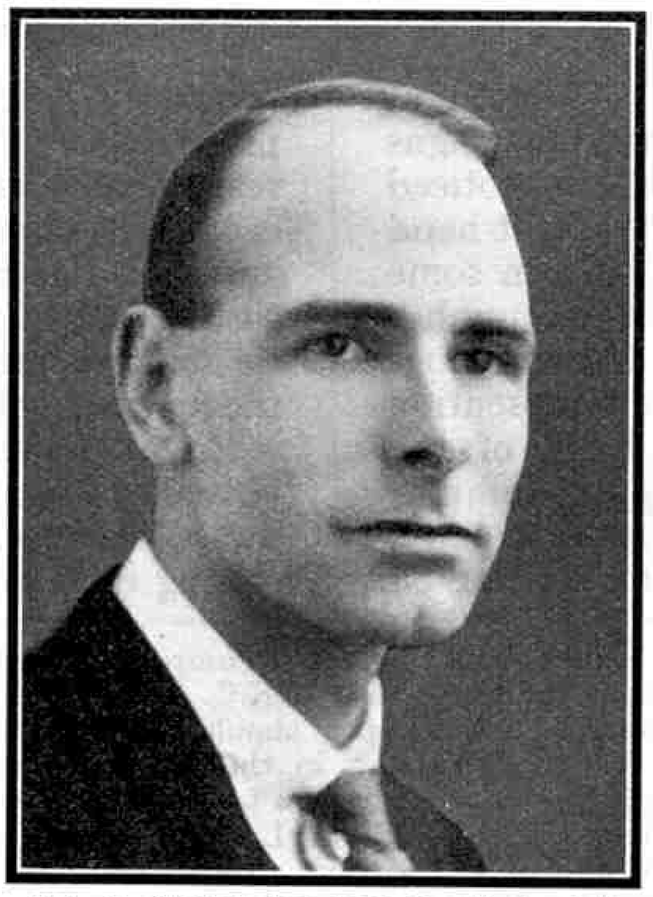
On the opposite page appears one of the most interesting photographs that I have been able to publish for quite a considerable time. It shows the football team of the senior section of the Herne Bay Meccano Club. This is called the Blue Triangle club, and the large blue badge worn by the members is a reminder of the association of the club with the Meccano Guild. The team has figured for two seasons in a local league of good class. It has quite held its own in the strenuous struggles with neighbouring teams, and at the close of last session, its first year of membership of the league, it held an excellent position in the table.

The Herne Bay club is well known for its splendid organisation and for the efforts made by the Leader and officials to maintain enthusiasm and increase membership. The programme followed is of an all-round character and the success of the club is a proof of the value of variety. The senior section came into existence as the result of a move to retain the interest of older members. These now meet during the week for the ordinary activities of a Meccano club, including Meccano model-building, discussions of engineering and related subjects, lantern lectures, talks by interested friends and indoor games of all kinds, including ice hockey. The League games of the Blue Triangle club are played on Saturdays, of course, and the combined effect of the indoor work and of the outdoor activities is to encourage in the members a sense of unity. Each individual member feels that he belongs to a body of importance, and the sense of loyalty thus encouraged brings in return the determination to do everything to demonstrate the value of membership of the Herne Bay Meccano Club.

Another great advantage of the organisation of a really live and strong senior section of this kind is that junior members are given something to aim at. Membership of the senior section is regarded as a privilege that will reward good work carried on through the junior stages of the club.

Meccano Club Presidents

No. 7. Mr. R. Traylen



Mr. R. Traylen has been President of the Sheffield M.C. since the affiliation of the club with the Guild in December 1927. He has inspired great enthusiasm among the members, who follow a very interesting programme of Model-building, Lectures, Debates and Games. A special feature is made of visits to works.

Letters from the Gold Coast

I have previously warned members of the Guild, and all Meccano boys against entering into communication with boys from the Gold Coast. A certain class of boy living in that part of the world makes a practice of securing the names and addresses of English boys from various publications and writing to suggest correspondence. The first letters are usually very plausible and friendly, but sooner or later come requests for various gifts, in return for which monkey skins and other curios are promised. Unfortunately the curios never arrive! Several recent instances of this that have come to my notice suggest a further outbreak of activity of this kind. Meccano boys who receive such letters should have no hesitation in destroying them immediately and they certainly should not be answered.

* * * *

The ninth Annual Exhibition of the Victoria (Glasgow) Meccano Club will be held on Saturday, 7th February, 1931. The Exhibition will be held in Victoria Park Church Hall, Bolshagrey Avenue, Whiteinch, Glasgow, and will be open from 3 p.m. to 7 p.m. Meccano boys and all interested in the Meccano Guild who live in Glasgow and district are cordially invited to be present. No charge will be made for admission.

I may remind Guild members and readers of the "*M.M.*" living in Newcastle-upon-Tyne and district that the Annual Exhibition of the Newcastle M.C. will remain open until 7th of this month. A Hornby Railway and a very extensive display of attractive working models are on view in the "*Newcastle Evening Chronicle*" Hall, Pudding Chare, from 2 p.m. to 9.30 p.m. each day, except on Saturday, 7th February, when the Exhibition will open at 10 a.m. The charge for admission is 4d., and for children under 14 years of age 2d.

Proposed Clubs

Attempts are being made to start clubs in the following places, and boys interested in becoming members should communicate with the promoters, whose names and addresses are given below :—

BOLTON—Fred Walsh, 60, Turton Street.

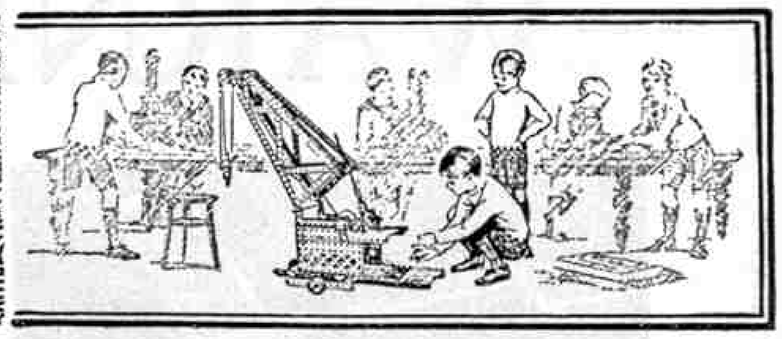
CLACTON-ON-SEA—M. H. Carter, Myrtle Villa, 35, St. Andrew's Road, Clacton-on-Sea.

SOUTH SHIELDS—R. Langley, 17, Hawthorne Avenue, Cleadon Park Estate.

SWITZERLAND—Mr. Fritz Adam, Rebwiesenst 10, Toess Winterthur.

TREHARRIS—Philip Leyshon, 118, Shingrig Road, Nelson, Nr. Treharris, Glam.

CLUB NOTES



Attenboro' Choir Boys M.C.—An interesting Lecture on "*Life in a Submarine*" was given by Commander Boyce, who afterwards judged models of submarines entered in a special Competition and presented the prizes. A Debate on "*Gas v. Electricity*" was contested by the Junior members, marks being awarded to the debaters by a Senior member who presided. The Football team is having an enjoyable season, members being keen and putting in good practice. Club roll: 23. *Secretary:* G. W. Render, Attenboro' Lane, Chilwell, Notts.

Pharos (Dover County School) M.C.—Carefully organised Model-building Contests are arranged regularly. In a Competition for models built from a specified list of parts first place was gained by a model of a Revolving Electric Fan and the second by one of a novel Physical Balance. Other entries included a Power Drill, a Steam Shovel, Aeroplanes and Cranes. A party chosen from those who entered models in this Contest visited the new Engine Sheds at the S.R. Dover Marine Station. Lantern Lectures on "*Aeroplanes*," loaned by the De Havilland Aircraft Co., and "*The Story of the London Omnibus*," the slides for which were provided by the London General Omnibus Company, have been given, other members of the school being invited to attend. In each case there was a large attendance. A super model of the Traction Engine sent from Headquarters was demonstrated by the Leader, Mr. A. E. Coulson, B.Sc., at one meeting, and a discussion on "*Rolling Friction*" followed. Club roll: 30. *Secretary:* G. L. J. Bailey, 40, Heathfield Avenue, Dover, Kent.

South Shields Y.M.C.A. M.C.—Interesting Model-building Evenings have been organised, and the standard of construction is steadily improving. One meeting was devoted to a particularly interesting Lecture on "*The Earth's Formation.*" Mr. J. Guy, the lecturer, dealt with the structure of rocks and the extraction of metals from their native ores. He also explained how welding is carried on and cross sections of welds made by modern methods were shown under the microscope. Club roll: 18. *Secretary:* Mr. G. H. Blanche, 241, South Palmerston Street, South Shields.

St. Columba's (Southwick) M.C.—A series of Model-building Competitions have included Simplicity Contests and others for original models, in addition to a Grand Autumn Competition in which a very large number of interesting entries were submitted. Interesting Competitions also have been held for the best Stamp and Cigarette Card collections. Papers on "*Lifeboats*," "*Bridges*," "*Sound*," the "*Electric Bell*" and other topics have been given by members. These were illustrated by models, and have become a ground for competition among members. Club roll: 35. *Secretary:* G. Spain, 6, Collingwood Terrace, Southwick, Sunderland.

Plymouth M.C.—The chief event of last session was an attractive Exhibition. The models on view included a Workshop, Double-decker Omnibus, Steam Roller, Pithead Gear, Motor Cycle and Sidecar, and a Racing Motor Car and Caravan. The youngest member of the club contributed an excellent model of a Tramcar. Mr. S. Foot exhibited a model of a Motor Bicycle on a stand, as shown at the Olympia Exhibition, and a competition was organised in which visitors were asked to guess the number of nuts and bolts in it. Special Model-building Nights have been devoted to the construction of Windmills and Aeroplanes. Other interesting items have been Debates, and a Lantern Lecture on "*The Peoples of India*" attracted special interest and was open to the public. Club roll: 22. *Secretary:* F. R. Hicks, "Broxholm," Redhill, Billacombe, Nr. Plymouth.

St. Feock School M.C.—Members are very keen on Model-building, and most meetings are devoted to this occupation. Papers by members also are read, a recent one of special interest being on "*Ships.*" Club roll: 10. *Secretary:* J. Rogers, West Trevilla, Feock, Nr. Truro.

Hendon M.C.—At a Business Meeting the club was divided into two sections. These are distinguished by the adoption of the official colours red and blue respectively and will compete in Fretwork and Model-building for a Cup to be presented at the end of the session. The Cup will remain for a period in the custody of the member whose individual marks are highest. General Knowledge Competitions have been held and a visit was paid to the Motor Show at Olympia. An exciting Treasure Hunt was recently arranged in which the organisers did their work too well, for up to date nobody has succeeded in finding the treasure! Club roll: 10. *Secretary:* P. H. Davies, 67, Sevington Road, Hendon, N.W.4.

Winchester (Leicester) M.C.—Hornby Train Nights are held once a month and Variety Nights are arranged regularly. Small prizes are awarded in the weekly Model-building Competitions. The best models submitted in these were shown in the Exhibition held in January, at which the Ship Coaler from Headquarters also was on view. Table Tennis Tournaments are the chief indoor recreation of members. Club roll: 11. *Secretary:* J. Green, 87, Winchester Avenue, Leicester.

Our photograph shows the officials and members of the Herne Bay M.C. Blue Triangle football team. This was formed by the senior members of the Herne Bay M.C. On the right of the photograph is C. W. Russell, secretary of the club. The team has achieved considerable success in the Canterbury & District League.

Wimbledon M.C.—A Mock Trial has been held, those taking part being in fancy dress suitable for the occasion. One member was charged with assault, but after an amusing investigation was found "Not Guilty." An interesting Debate on "*Wireless Receivers v. Gramophones*" was held, the speakers making their points with great vigour. Games Nights are held regularly, Draughts and Table Tennis being the chief of those played. Table Tennis Tournaments are arranged regularly and are keenly contested. Club roll: 16. *Secretary:* G. W. Rose, 117, Dora Road, Wimbledon Park, S.W.19.

Wallington County School M.C.—On Model-building Evenings members usually work in pairs, and are allowed free choice of the model to be constructed, except in Competition. In the most recent Contest they were required to build models of "*R101*" without the help of photographs or drawings. Memory tests of this kind are very popular. A lecture on "*Aeroplanes*" was given by a former member of the club, who illustrated his remarks by drawings and exhibited a model monoplane that he had constructed himself. Club roll: 15. *Secretary:* H. Bond, "West View," Plough Lane, Wallington.

Middlesbrough M.C.—A talk on "*The World's Largest Suspension Bridge*," at Philadelphia, U.S.A., was given by Mr. Senior. An innovation that has become the most popular indoor sport is Balloon Handball. Exciting games are often played and cause great amusement. The Annual Christmas Party was very enjoyable. Club roll: 24. *Secretary:* R. Rowlatt, 31, Blenheim Villas, Longlands Road, Middlesbrough.

Tynecastle (Edinburgh) M.C.—The Senior members are studying wireless reception, and have assembled an excellent three-valve receiver. Model-building Evenings have been arranged for the Juniors, and at these the Senior members act as guides and instructors. Club roll: 35. *Secretary:* Wm. Urquhart, West Bank, West Mill Road, Colinton, Edinburgh.

Sid Vale M.C.—A successful Exhibition took the form of a model Fairground, a Roundabout, a Big Wheel, Swing Boats and other features of a fair having been constructed by members. Other models on view included a Meccanograph, a Tramcar, a pair of revolving Aeroplanes and prize-winning entries in competitions. A cinematograph film illustrating the making of paper was shown. Club roll: 24. *Secretary:* R. Passmore, Ivedon Cottage, Newtown, Sidmouth.

Great Baddow M.C.—A very successful Concert was presented on Visitors' Night, at which the President, Mr. S. L. Beale, presided. Prizes for the session were presented, and the proceeds amounted to more than £7. A Birthday Party was held as part of the New Year programme, the Birthday Cake being kindly given by Mrs. S. L. Beale. Club roll: 47. *Secretary:* Miss D. French, Jefferys House, Gt. Baddow, Essex.

NEW ZEALAND

Hawera M.C.—At one meeting the article on the "*George Bennie Railplane*" published in the "*M.M.*" for August last was read and discussed. Several Mock Trials have been held, these always creating great interest. Attractive Contests have included Model-building Competitions, and a Drawing Contest in which competitors were asked to submit drawings of engines of any kind. A photograph of the members has been taken and prints sold on behalf of club funds. Club roll: 14. *Secretary:* Mr. A. Brooks, 35, Burn St., Hawera, New Zealand.

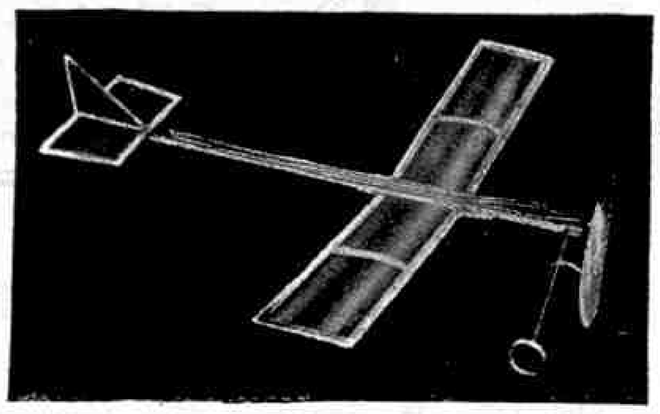
Wiseman's (Auckland) M.C.—Remarkably interesting Lectures have been given. These included talks on "*Railway Accidents and how they are dealt with*" by Mr. Mackley, formerly Chief Locomotive Engineer of the New Zealand Railways; "*Astronomy*" by Mr. Bruce, who illustrated his lecture by means of lantern slides; "*A Railway Tour of Great Britain*" by Mr. Wright; and "*The Engineers of the Future*" by Mr. Woolley. At other meetings models constructed by members were discussed, and suggestions for improvements and variations made. A number of interesting Model-building Competitions have been held. The club's cinema projector has been well used, many interesting films having been exhibited. *President:* Mr. F. Wiseman, 170, Queen St., Auckland.

SOUTH AFRICA

Germiston M.C.—Interesting Model-building Competitions have been held, and many excellent working models have been entered in them. Mr. W. G. A. Mears, Leader of the club since its foundation, has left to take up a new appointment in Cape Town. Club roll: 9. *Secretary:* C. Berrange, P.O. Box 63, Germiston, Transvaal.

Malvern Wesleyan M.C.—A talk on "*Tennis*" was given by Mr. L. Raymond, one of South Africa's foremost players. Mr. Raymond demonstrated the strokes of the game and answered questions from members. "Hat Nights" are popular and on a recent occasion the subjects discussed included "*Road v. Rail*," "*Talking v. Silent Pictures*," "*Mechanical Engineering*," and "*Is War Finished?*" At these meetings one member concludes the proceedings by criticising the speeches delivered. A visit was paid to the Turffontein Intermediate School M.C., where the Leader, Mr. E. Sykes, gave an address on the "*Aims and Objects of the Meccano Guild*," and promised to give a medal for the best work done on behalf of the Turffontein Club prior to its affiliation with the Guild. The joint meeting concluded with refreshments and games. Club roll: 44. Leader: Mr. E. Sykes, P.O. Box 8, Cleveland.

WARNEFORD MODELS



BUILT TO FLY WELL!

THE "MOTH" TRACTOR. *Price* **4/6**

Length 19 in., span 18½ in., fitted patent double bearing and shock-proof chassis, 8 in. hand-carved and balanced propeller, covered red proofed silk. A splendid flyer, and beautifully finished, this model at the price is undoubtedly the finest value ever offered. (Patent No. 296946).

THE "SWIFT" TRACTOR. *Price* **10/6**

Length 30 in., span 26½ in., fitted 11 in. hand-carved and balanced propeller. Patent double bearing and shock-proof chassis. Covered yellow proofed silk with identification discs. A long and very steady flight is obtainable with this model, and though of large dimensions is very easy to handle. (Patent No. 296946).

USE "RUBERLUE" (Doubles the Flight) 6d. TUBE

THE WARNEFORD WINDER.
Universal Fitting for all Warneford Models. Price 2/6.

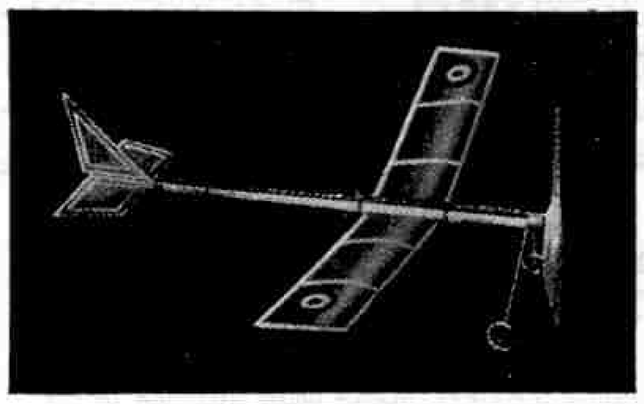
FORM A FLYING CLUB AT YOUR SCHOOL

Have Duration Contests, Speed Trials, Stunt Flying —it's great fun, and join the

WARNEFORD JUNIOR AIR LEAGUE.

(Full particulars are in every box).

Spare Parts for Warneford Aeroplanes may be obtained from all good stores and toy shops. If you have any difficulty in obtaining your requirements write to the manufacturers for name of nearest stockist.



THE "DEMON" TRACTOR. *Price* **7/6**

Length 25½ in., span 23 in. Fitted 10 in. hand-carved and balanced propeller, patent double-bearing and shock-proof chassis, covered yellow proofed silk with identification discs. Weight and wind resistance are reduced to a minimum in this model, giving the utmost duration of flight. (Patent No. 296946).

THE "WIZARD" CONSTRUCTION SET.

Low Wing. Full Cantilever Monoplane.

Builds a replica of machine that won the Sir Charles Wakefield International Cup (1929) and the S.M.A.E. Freshmen's Competition (1930).

Speed 16 m.p.h. Ceiling 120 ft. Glide 1 in 10. Landing speed 14 m.p.h. Length 32 in. Span 48 in. Weight 10 oz.

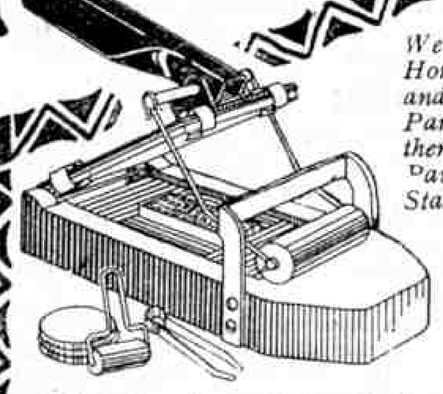
Full set of parts with full-size working drawings and complete instruction book. Packed in strong leather board box. Price **35/-**

SOLE MANUFACTURERS: F. J. MEE, GREENWICH, LONDON, S.E.10. PRICE LIST POST FREE.

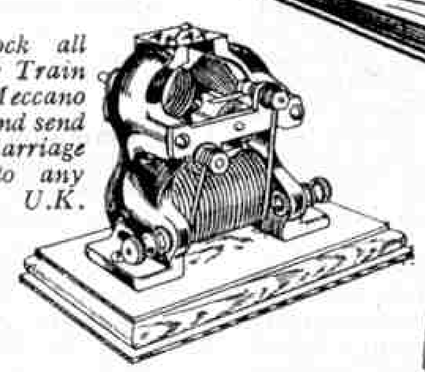
GREAT RUSH FOR GAMAGES

NEW TOY & MODEL CATALOGUE

Applications for the new edition of Gamages monster catalogue for boys are pouring in. It is bigger and brighter than ever. 140 pages illustrated in colour and crammed with all the latest toys, models, and games. Send for your copy now or you may be disappointed—the edition is limited.



We stock all Hornby Train and Meccano Parts and send them Carriage Paid to any Station U.K.



Printing Machine

The New Baby Adana, a real automatic self-inking, self-printing machine. Complete with real printer's metal type, spaces and ink. Can print tickets, labels, visiting cards, etc. Price **10'6**

Post 6d.

TOY MOTOR

Finished in black enamel. Will run on a single cell dry battery. Weight 1 lb. Base 3×3½×4 ins. Price **8'6**

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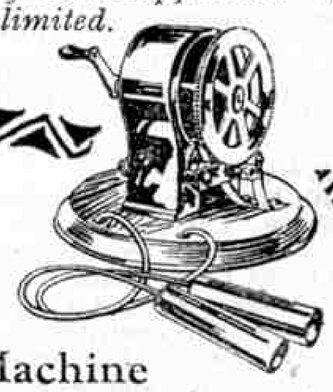
THE ZULU BLOW GUN

A most fascinating toy for indoors and outdoors. Harmless and instructive, complete with 6 Indoor Arrows, and 3 Outdoor Arrows, 4 Targets, Blow Gun and Instructions. Post 9d. Price **5'11**



"Tesla" Magneto Electric Machine

Operated by crank. Wheel and pinion have cut teeth ensuring smooth action. Substantial brass bearings. Well made throughout. Finished in red enamel with nickel plated fittings. Polished wooden base with neat bushings for Conductor cords. Price **7'11**

Post 6d.

THE BOYS OWN STORE

GAMAGES HOLBORN, E.C.I.

City Branch, 107, Cheapside, E.C.2.

A Useful Instrument for the Experimenter

Meccano is ideal for carrying out experiments in practical mechanics, and we are able to offer (at the special price of 1/7½ post free) a limited number of spring dynamometers, which will be found invaluable for experimental work of this kind. These dynamometers are made from brass and, as shown in the accompanying illustration, are graduated to register a maximum tensional force of 250 grammes. Each instrument is fitted with two hooks so that it may be attached easily at the required point in a model. With the aid of these dynamometers it is possible to carry out many interesting experiments, dealing with Force, Friction, Momentum, Inclined Planes, Gravity, etc., and many additional uses will at once suggest themselves to constructors.

Although these meters are being offered at such a remarkably low price, it should be borne in mind that only a limited number are available and once present stocks are exhausted it will be impossible to repeat. Orders, each accompanied by a remittance of 1/7½, should be forwarded to Meccano Ltd., Binns Road, Old Swan, Liverpool, as early as possible.

To THE COUNTY CHEMICAL CO. LTD.,
CHEMICO WORKS, BIRMINGHAM.

Please send me a copy of your catalogue.

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RIDE behind "CHEMICO"

Not until you have ridden a bicycle fitted with a good acetylene lamp charged with "Chemico" Carbide, can you fully appreciate the joy and safety of night riding. Backing every tin of "Chemico" Carbide is a thirty year old reputation. During those years millions of tins have been used without letting one single cyclist down. This is a big claim, but your father will soon tell you how true it is. He used "Chemico" when he was your age.

Fill in the coupon above and post it to-night. We want to send you the "Chemico" Catalogue POST FREE.

You'll want some carbide to-night. Go and ask your cycle agent for a tin of "Chemico." A pound tin only costs 7d.

World's Largest Lorry—(*Continued from page 105*)

locomotives may be moved bodily from the works to the docks. In order to do this a short length of rail of correct gauge is laid down on the carrying portion of the lorry and the locomotive run on to it. It is then carefully chocked in position and the road journey begins. This is slow, for great care must be taken when negotiating corners, and, of course, other traffic must not be interfered with.

On arrival at the dockside the girders of the carrier are lowered to the ground, the pin in the articulated joint is knocked out and the whole of the motive unit, including the swan neck, and the hydraulic rams, drawn bodily away. A sloping ramp is then placed against the two ends of the girders. On these there are rails of the same gauge as those on the lorry, and the locomotive is simply rolled off by means of a pinch bar. The entire operation of unloading a heavy engine occupies only 20 minutes and there is no necessity to employ heavy and expensive cranes.

It is interesting to note that M.R.S. Ltd. recently employed their lorry to transport six heavy locomotives from Leeds over the Pennines and the Yorkshire moors to Manchester. These were for the Soudan Government, and one of the conditions imposed was that the engines should be delivered complete. If it had been necessary to dismantle the locomotives for transport, the order probably would have gone abroad.

Complicated cranes and electrical machinery also are readily transported by means of the M.R.S. lorry, and the practice is becoming popular because often it makes dismantling unnecessary. Machines must always be erected in the works in which they are made in order that they may undergo the necessary tests. For transport in the ordinary manner they are then taken to pieces and the parts re-erected on arrival. This takes time and is costly, and many manufacturers now prefer to use the large road vehicles that make it unnecessary. The only restriction on the size of a machine or casting to be transported by road is that imposed by the width of the roadway under bridges, or the strength of the structures over railways and canals that have to be crossed. As a rule several alternative routes are available, and the best of these may be chosen. As already explained, roadways may be lowered in order to give head room, and bridges may be strengthened in order to allow the passage of a particularly heavy load if further steps of this kind are necessary.

For the conveyance of these loads it is not always necessary to make use of the world's largest lorry, and a number of smaller vehicles are employed by M.R.S. Ltd., in moving boilers, electrical transformers, rotors of alternators, stern frames and rudders of large vessels and similar cumbersome loads.

The 100-ton lorry may be used for loads of less than 65 tons on removing four wheels at the rear of the machine, these being easily replaced when machinery weighing more than this is to be carried. Another type of lorry carries loads not exceeding 40 tons. This has permanent jacks fixed to the chassis members. When the back end of the lorry is lowered to rest on these the rear axle may be removed, and boilers and similar loads may then simply be rolled off the lorry, no crane being necessary to remove them.

OUR MAIL BAG

In this column the Editor replies to letters from his readers, from whom he is always pleased to hear. He receives hundreds of letters each day, but only those that deal with matters of general interest can be dealt with here.

Correspondents will help the Editor if they will write neatly in ink and on one side of the paper only.

P. Mills (Bristol).—Technical words describing the nature of chemical compounds do not comply with the conditions of our Long Words Competition. It hardly seems fair to attack an unsuspecting malaria microbe with "Diethylaminoisopentylaminomethoyquinine!"

H. W. Sharland (Frome).—The "*M.M.*" "not only interests me, but also my father, who is a keen engineer, and who takes the liberty of using my Meccano when I am away!" This surreptitious use of Meccano is becoming quite common among fathers, although many of them refuse to confess it.

H. Sebel (Westcliff-on-Sea).—Although your father was surprised at the quantity of information we sent you, this is not uncommon, for we are always glad to hear from readers and to do our best to help them. That's what we are here for! We are pleased to learn that your Meccano Club is now well established.

D. N. Fisher (Melrose, Massachusetts, U.S.A.).—You have certainly created a new record by losing only two hooks in four years, and we congratulate you on the excellent manner in which you look after your Outfit. Meccano parts are too precious to lose, but fortunately most mothers understand that they are sacred.

Mr. F. E. R. Nunn (Colchester).—It is interesting to hear that you received your first Meccano Outfit 21 years ago, and that you have been a reader of the "*M.M.*" since it was given away in the form of a double sheet. This is a splendid record. We hope you will still be a Meccano "boy" in 21 years from now!

Mr. G. D. Stampados (Athens).—Many engineers and inventors in this country use Meccano in working out their ideas, and we feel sure Meccano will prove useful to you in your career. We should be glad to have details of interesting engineering works in Greece.

N. B. Scott (Winnipeg, Canada).—We agree that the mass production of motor cars is extremely interesting. We should like you to see Meccano and Hornby locomotives and trains being manufactured here; the making of such small engineering parts is very fascinating to watch.

R. Styles (Loscoe).—"The articles are just my sort, so you've fixed up at least one person! Goodness knows how you can compose such good stuff, but it's there!" We are glad to hear your good opinion of the "*M.M.*" Let us know more about your Hornby Railway when you have time.

Mr. K. E. Haines (Punxsutawney, Pa., U.S.A.).—If we were to adopt your suggestion to produce a series of trains at much higher prices we could of course produce models more perfectly to scale; but the demand for costly scale models is very limited. Our aim is to manufacture good railway models at a price within the reach of the average boy.

George Watson (Birmingham).—Our larger locomotives and rolling stock would certainly run more perfectly on curves with a radius of 3 ft. or 4 ft., but a layout constructed with such curves would take up far more room than is available in the average house.

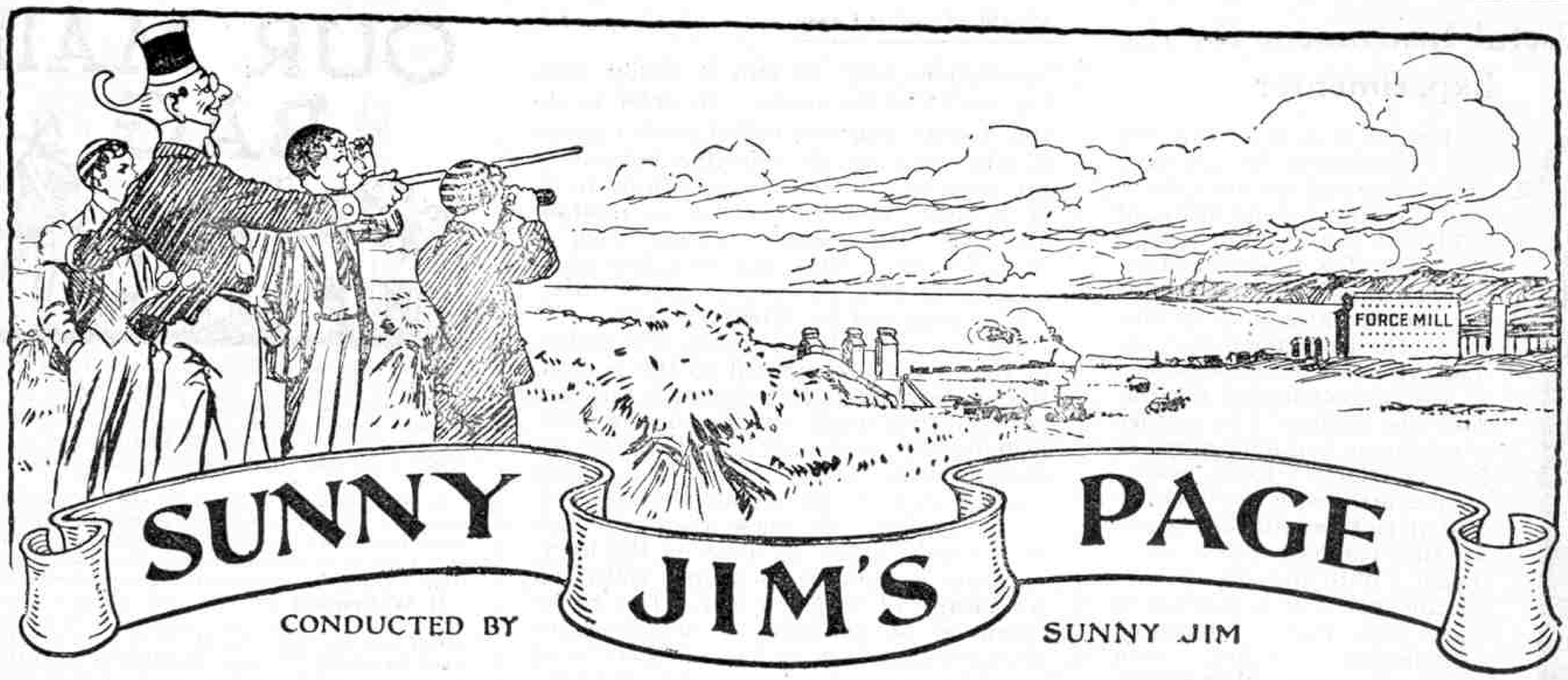
T. Thomson (Dewsbury).—There is no reason why you should not join the H.R.C. as well as the Guild, in fact thousands of boys are members of both. It is a good idea to have one correspondent interested in Meccano and the other in model railways.

H. Tomlinson (Shrewsbury).—We very rarely receive a complaint that the "*M.M.*" articles are too advanced for younger readers. Perhaps some of the subjects dealt with may be of interest mainly to older boys, but we have to try to cater for all readers. Let us know to which particular articles you refer.

C. Watkinson (Dunedin, N.Z.).—We are interested to hear that your exhibition of quaint models from "*Adventures in Meccanoland*" proved such a success. These tiny models seem to fascinate everybody. We shall be glad to have details of the new ones you have "created."

H. Elliot (Wolverhampton).—There is no doubt that a large proportion of "*M.M.*" readers are interested in music, but we doubt whether a monthly article on this subject would be of general interest. You will be pleased to hear, however, that, in response to continued requests, we intend to commence a series of notes on the gramophone and the best records issued during each month.

W. Wright (Southampton).—It is certainly true that the continued introduction of new and improved locomotives is apt to make one dissatisfied with the old types. This is one of the penalties of progress!

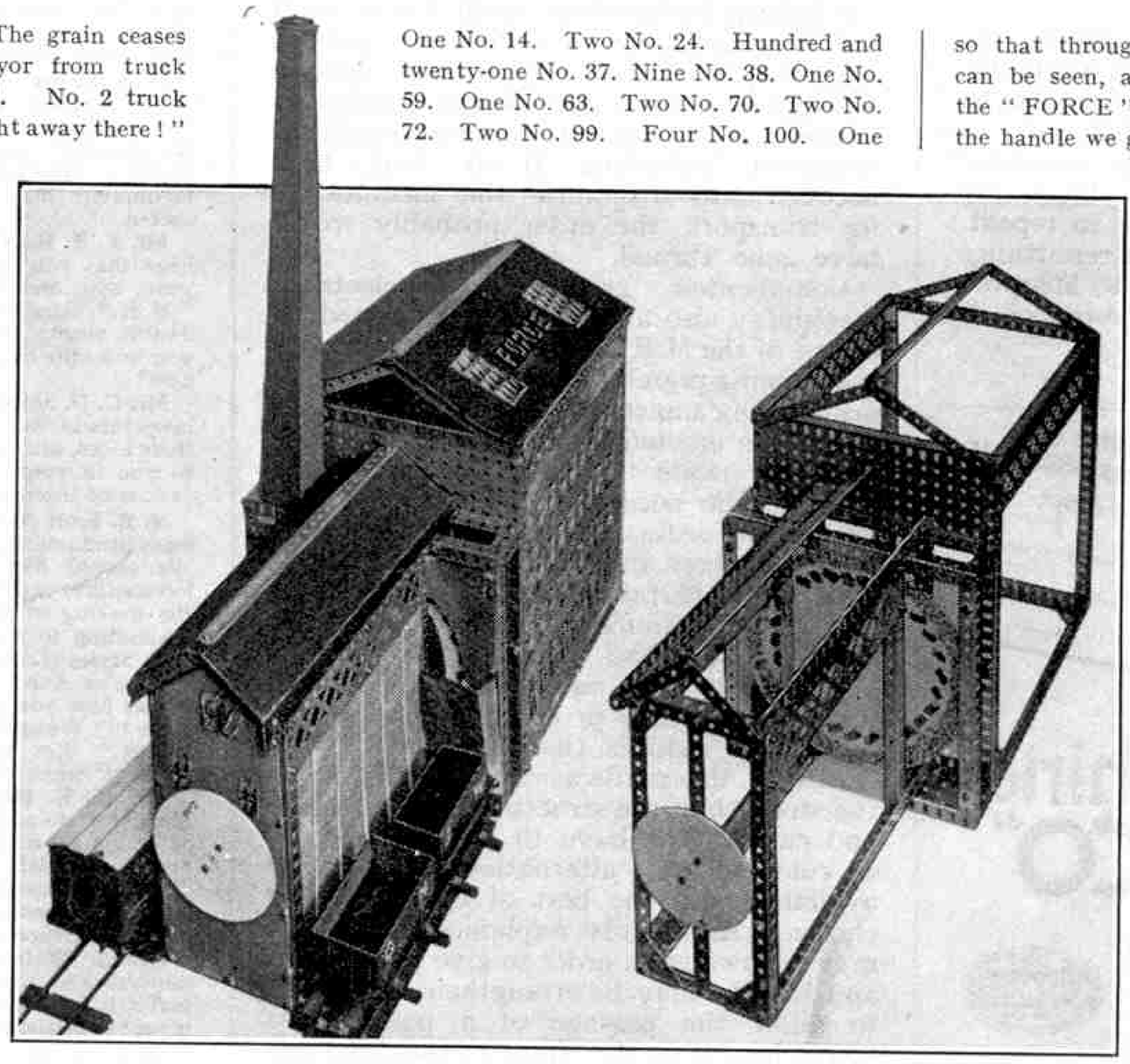


MAKE THIS WORKING MODEL OF "FORCE" MILLS

"Ease her!" "Stop her!" The grain ceases its headlong course up the conveyor from truck to mill. No. 1 truck has unloaded. No. 2 truck is running up to take its place. "Right away there!" No. 1 is shunted on to the siding. Already No. 2's load of wheat is diminishing, for the golden grain is racing in a steady stream to the topmost floor of the "FORCE" mills. Here it is cleaned preparatory to being turned into "FORCE."

As this work proceeds men are busily engaged on the other side of the mill loading "FORCE" for shipment to England. The last truck is loaded. The hubbub momentarily ceases. "All right!" comes faintly from the guard back in the rear of the train.

"Let her go!" shout the men, and with a great hissing and chuffing the big Canadian Pacific locomotive gets under way. Thch–thch–thch–ch-ch-hhhhhhh–Thch–thch–ttthch–chhhhhhhhh Shirrip-pip! "Good-bye!" "Non-stop Montreal." "Dick!" "Yes, Mother!" "You'll spoil your shoes if you sit on your heels in that way!" "All right, Mother!" "It's tea time, Dick. I have a special treat for you and Harry, 'Force' and, what do you think?" "'Force' and Peaches?" "No!" "'Force' and stewed fruit?" "No, not quite!" "'Force' and cream?" "No, try again, Dick!" "'Force' and tinned pears?" "No, something warm." "Give it up, Mother, but I did hope there was some fruit in it." "Ah! you gave up too soon, Dick. It's 'Force' with stewed plums and rich creamy custard. Come along, boys."



While Dick and Harry are away at tea, let us take a tour of inspection round their model and see what kind of a jolly game they have been playing. "Ah! Here's the 'FORCE' mills! Quite realistic, too. Framework of Meccano parts and a covering of cardboard bolted into position and painted with brick red walls and a black roof. Let us make a list of the parts they have used so that we can make a model like this, too. Take this down on a piece of paper. Ready?

"Two No. 1. Two No. 1a. Four No. 2. Three No. 3. Twelve No. 8. Fourteen No. 8a. Two No. 9a. Two No. 9d. Two No. 9e. Ten No. 12. One No. 13a. One No. 14. Two No. 24. Hundred and twenty-one No. 37. Nine No. 38. One No. 59. One No. 63. Two No. 70. Two No. 72. Two No. 99. Four No. 100. One No. 115. Ten No. 133.

"Now! How are the parts put together? H'm! This is going to be difficult." "Can I help?" "Hello, Dick! Yes, you can. We want to show other Meccano boys how to make a model like yours. What's the best way to do it?" "Why, show them a photograph of it, of course." "That won't show them the inside." "Give them two photographs, then. After you have taken the first I'll take off the walls and roof and then you can take a picture of the 'skeleton.'" "Good idea, Dick. I'll get my camera."

The "FORCE" Mills are soon photographed and on this page we are able to print the result so that other Meccano boys can build this model, too.

Now let's see how the model works! This handle on the cardboard disc at the end of the mill turns the disc in the middle of the mill. That disc has two circles on it. One has wheat glued on and the other is a circle of tiny "FORCE" packets. In front of this disc is a "screen" of cardboard cut so that through the left-hand slot only the wheat can be seen, and through the right-hand slot only the "FORCE" packets appear. Now when we turn the handle we get the effect of wheat being conveyed up into the mill from the left-hand side, and "FORCE" packets pouring but on the right-hand side Dick has fixed a "baffle" in front of each slot so that no one can see where the wheat comes from or where the "FORCE" goes to.

A model truck loaded with wheat grains placed under the left baffle appears to be unloading into the mill, and a model truck placed under the right baffle seems to be taking on a load. Dick has made some realistic miniature "FORCE" packets by painting tiny labels and sticking them on to little wooden blocks cut to the right shape. The "FORCE" packets that pour out from the mill are these tiny "FORCE" labels pasted to the cardboard disc.

Dick is now starting his Canadian Pacific train on its return trip from Montreal, while Harry is coming up with the wheat freighter. Let us leave them to the fun, and see if we can use the photographs to make a similar model for ourselves. Some of us haven't all the parts, but we all will manage somehow.

"What do you think? Harry so enjoyed his 'FORCE' tea that he wants me to tell everyone who reads this paper that 'FORCE,' the whole wheat flake food, is just delicious. For breakfast, we eat 'FORCE' with hot milk. It makes a delicious warming dish, and, of course, needs no cooking, because it is cooked at the mills. Eat 'FORCE' *every* day, you'll like it, same as I do."

Sunny Jim

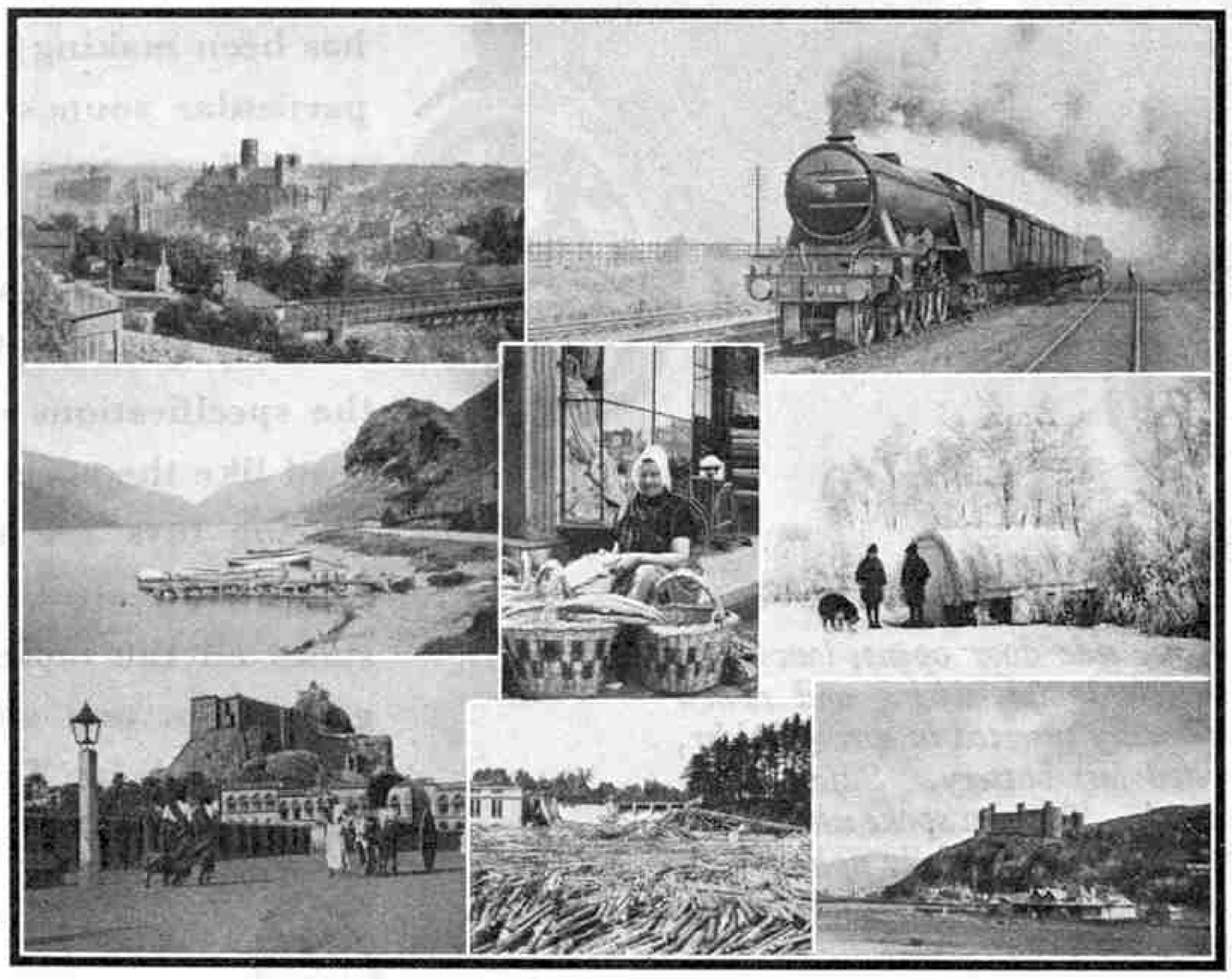
FREE TO MECCANO BOYS

A sheet of 66 miniature "FORCE" packets ready gummed for making models will be sent to any boy who sends "Sunny Jim" a top from a real "FORCE" packet and his name and address. Mark your envelope "Packet" in top left-hand corner, and post to "SUNNY JIM," (Dept. C.B.2), 197, Gt. Portland Street, LONDON, W.1.

Competition Page

WORD BUILDING

We have commented previously that competitions associated with words and word building are among the most popular and well-supported of those set in the "*M.M.*" Probably that is because word puzzles are always straightforward and simple. If that is the secret of popularity, the competition we set this month should prove the most popular of all. Readers are required merely to choose a word from the advertisements—any one they like—in this issue of the "*M.M.*" and to build from the chosen word as many other words as they can. This sounds quite easy, and it is certainly simple, but competitors will be well advised to bear in mind that the longest word to be found among the advertisements may not prove the most suitable for the purpose of this contest. The advertisements of Meccano Limited are not barred for the purpose of this competition, but competitors should scrutinise carefully every advertisement.



A selection of prize-winning photographs from the 1930 Competitions. Reading from left to right: Top Row—1. "Durham" by A. L. Northedge, Hull, from the September Contest; 2. "Homeward Bound," C. Crocker, Letchworth, September Contest. Middle Row—1. "Taly-Llyn Lake," J. A. Wagstaffe, Worcester, May Contest; 2. "The Fish Seller," A. W. Edwards, London, April Contest; 3. "Early Morning Hoar Frost," J. A. Siddons, Alberta, August Overseas Contest. Bottom Row—1. "The Rock Fort," Miss S. Savithri, Madras, August Overseas Contest; 2. "A Canadian Lumber Creek," J. Baldwin, London, N.W.8, July Contest; 3. "Harlech Castle," G. M. Lane, Wakefield, July Contest.

The prizes—to be awarded to the senders of the four longest lists of approved words, in order of merit—will consist of goods to the value of 21/–, 15/–, 10/6 and 5/–, the goods to be chosen from the range of products of Meccano Limited, or, if preferred, from the catalogues of the firms from whose advertisements the winners have taken their specimen word. In addition to the principal prizes there will be a number of consolation prizes.

Competitors should note carefully the following points. The word selected as the base of the entry may be of any kind—an advertiser's name, the trade mark of an advertised product, or even the name of a stamp issuing country from a stamp advertisement may be used—but the list of words built from it must not include proper nouns, e.g., boys' or girls' names, or names of rivers or countries or places. No word may use a letter more frequently than it appears in the specimen word.

Each competitor must state his name and address, the selected word, the advertisement from which it was taken, and the number of words built up, at the head of his entry, which must be written on one side only of each sheet of paper used. Entries must be addressed to "Built Words, Meccano Magazine, Old Swan, Liverpool," and must reach the Editor not later than 28th February. Overseas closing date, 30th May.

An Ideal Career

Among the many interesting series of articles that have appeared in the "*M.M.*", a very high place is taken by that now appearing dealing with the possibilities of careers in the various great professions. The volume of appreciative correspondence has been enormous, and there is ample evidence to show that the guidance afforded by these articles is being employed to good purpose by very many readers.

Already the series has covered most of the great branches of engineering, and attention is now turning to the many "black-coated" professions—Accountancy, with which we deal this month, the Law, Medicine, Architecture, Journalism and Advertising, to give but a brief list.

With the great multiplicity of outlets for career building before us, it would be interesting to know just which is the favourite among our readers, and readers are invited this month to submit short essays entitled "My Ideal Career and why I choose it."

Prizes to the value of 21/–, 15/–, 10/6 and 5/–, to be chosen from the catalogues of Meccano Ltd., or, at the winners' option, to consist of books relating to the chosen profession, will be awarded to the senders of the four best essays in order of merit. In addition, there will be a number of consolation prizes.

Entries must not exceed 500 words in length, and only the competitor's name and address may appear on the back of each sheet of paper used. Entries must be addressed to "Ideal Career, Meccano Magazine, Old Swan, Liverpool," and must reach this office not later than 28th February. Overseas closing date, 30th May.

Competition Results

HOME

Fireworks.—1. L. R. Watts (Bristol); 2. H. R. Hadden (West Moors, Dorset); 3. H. Everitt (Norbury, S.W.16); 4. R. Fullerton (Stanford-le-Hope). Consolation Prizes: Miss E. Fullerton (Stanford-le-Hope); D. Hollinshead (Middlewich, Ches.); A. L. Fletcher (Lincoln); C. Redmond (Liverpool); D. Townsend (Coxbench, Nr. Derby); Wm. Chrichton (Glasgow).

Code Words.—1. G. A. Chaplin (Headcorn, Kent); 2. S. Ashton (Kingham, Oxon.); 3. J. Hodgson (North Finchley, N.12); 4. Campbell (Cupar). Consolation Prizes: N. Westcott (Grimsby); S. Burton (East Ham, E.6); G. Couper (Edgware); J. R. Spooner (Manchester); R. F. Newton (Buckhurst Hill); D. Birkett (Leicester); C. S. Ronayne (Dublin); A. D. Lawton (Wallington).

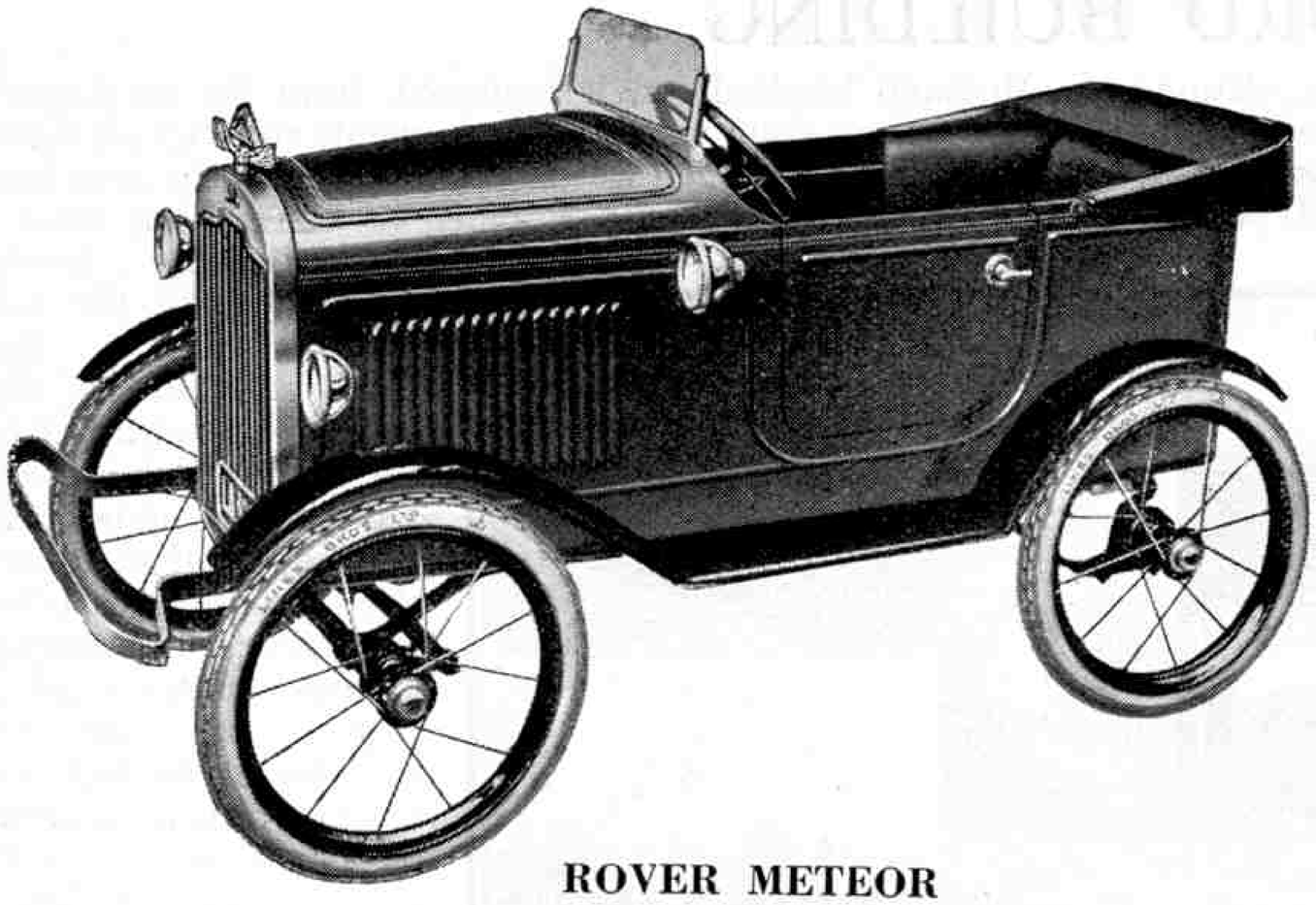
Christmas Presents Competition.—Once again the Meccano Outfit No. 7 proved the most popular article in the Christmas Present Competition, and was followed very closely by the Hornby No. 2 Special Pullman Set, L.N.E.R. type. The next four articles in the order of voting were: Hobbies' A1 Fretwork Set, the Adana Printing Press, the Warneford "Wizard" Aeroplane Construction Set and the Regent Electrical Set.

No boy succeeded in giving a completely accurate forecast of the massed voting in the competition, and the prize was awarded to G. M. Lane, 6, Bradford Road, Wakefield, whose entry was the nearest.

Engineering Jokes.—1. R. Norris (Ebbw Vale); 2. H. Rutter (Consett); 3. A. F. Milburn (Chingford, E.4); 4. E. Thompson (St. Leonards-on-Sea). Consolation Prizes: J. Bell (Ascot); K. J. Coppin (Swindon); L. R. N. Mills (Dorchester).

Other competition results on page 168.

There's sound engineering in these Tri-ang Toys!



ROVER METEOR

All-steel pressed moulded body, side door opens, louvres in bonnet. Fitted with two electric lamps, wiring and switch for flash dry battery, which is easily inserted in spring holder, no wires to connect. Supplied less battery. Safety glass windscreen, ball-bearing back axle. Tangent spoke wheels with 1" imitation pneumatic tyres, seat and back fully upholstered. Handsome mascot. Bulb horn. Dummy hood, mudguards and steps, petrol and oil tins, bumper.

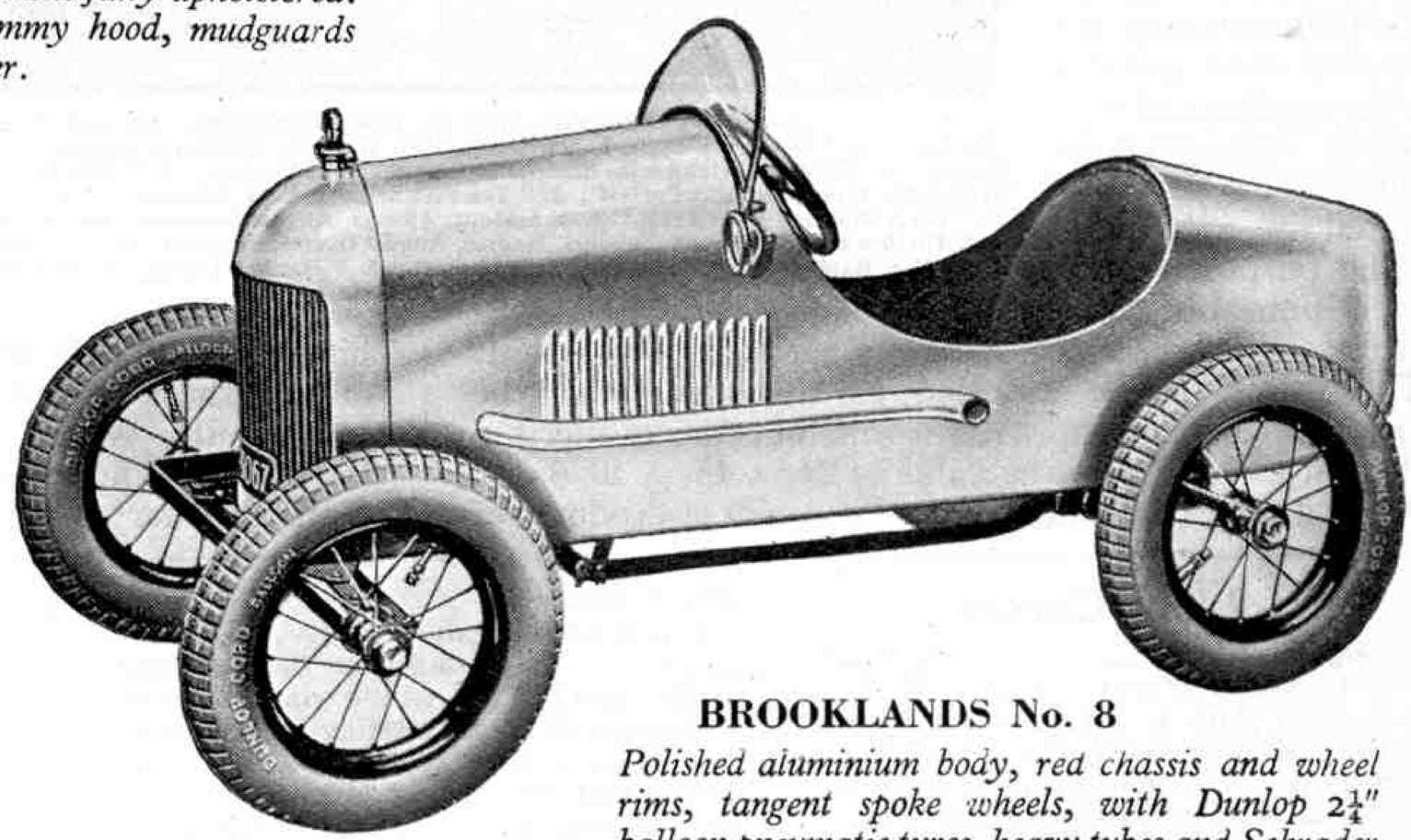
Engineering soundness is written all over them. Turn them upside down or inside out, and you'll find that someone has been making toy cars for the rather particular youngsters of to-day. These are Tri-ang toys, and that someone is Lines Bros. Limited. All-steel bodies—lamps that light—ball-bearing back axles—safety glass windscreens—bumpers—the specifications of these Tri-ang toys read like the specifications of real cars. Tri-ang toys are made in England by England's master toy-makers. Made to stand all the buffetings that a boy can give them, and still be in good going order! Ask for Tri-angs at your nearest toy-dealer's.

L. BROS. LTD. LONDON BROS. ENGLAND

Lines Bros. Limited make these all-metal toys — tip lorries, wagons, vans, breakdown lorries, fire-engines, taxis, buses, planes, folding airplanes, dolls' prams, Fairycycles, tricycles, scooters, pedal kars, locomotives train sets, folding barrows, etc.

* * *

Lines Bros., Ltd., will be exhibiting at the BRITISH INDUSTRIES FAIR, Olympia, Stand E.1, February 16th - 27th.



BROOKLANDS No. 8

Polished aluminium body, red chassis and wheel rims, tangent spoke wheels, with Dunlop 2¼" balloon pneumatic tyres, heavy tubes and Schrader valves. Aluminium radiator, padded seat, spring steering wheel, ball-bearing back axle, double-crank drive, rubber pedals.

TRI-ANG

CARS & ALL-METAL TOYS

Made by LINES BROS. LIMITED, MORDEN ROAD, MERTON, LONDON, S.W.19.

Fireside Fun

TELLING THE TRUTH

A clever young man was wandering up and down the platform in the hope of finding an empty compartment. His search was fruitless but while standing by the last coach he thought of a brilliant plan.

"All change here; this carriage isn't going!" he cried in an authoritative manner. With much haste and annoyance the passengers got out to seek seats elsewhere in the train, and the young man settled down in a corner feeling quite pleased with the success of his ruse.

After a quarter of an hour or so the station master put his head inside the window.

"Are you the smart young fellow who told the people this carriage wasn't going?" he asked.

"Yes," replied the young fellow.

"Well," said the station master with a grin, "the porter heard you telling the people, and he thought you were a director. So you were quite right. It isn't going, for he uncoupled it."

* * * *

Two friends on a seaside holiday were walking along the shore.

"What are the wild waves saying?" dreamily demanded the romantic one.

"Sounds very like 'splash' to me," replied his prosaic friend.

* * * *

A Scotsman arrived at Euston Station one day at about 1 p.m., and not being well acquainted with London, asked a taxi-driver if he could drive him to catch a train at Waterloo Station at four o'clock.

The driver said he thought he could do it in the time and held the door of his cab open for the traveller, who got inside and was driven about London for nearly three hours.

When he was set down at Waterloo the Scotsman beckoned to a policeman.

"What's the fare from Euston," he asked politely.

"Two shillings, sir," replied the policeman.

"Here," said the canny one, handing him the money, "will you kindly settle with the driver while I get my ticket?"

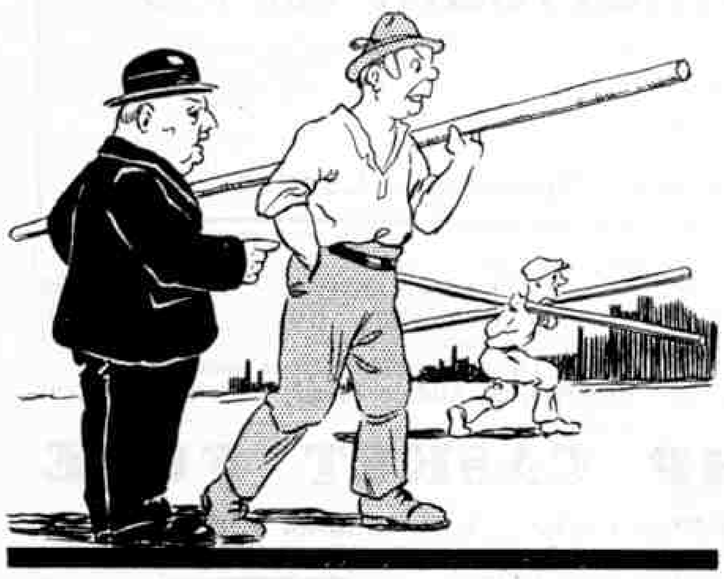
* * * *

Boy: "Do you keep the '*M.M.*'"

Newsagent: "No, we sell it, we never get chance to keep it."

* * * *

SHEER LAZINESS



Foreman: "Why is it that Smith over there always carries two poles, while you never carry more than one?"

Navvy: "He's too lazy to make two journeys!"

* * * *

"Do you know that Bill Smith is going to sue the company for damages?"

"No! What ever have they done to him?"

"He was carrying a heavy block of wood when they blew the knock-off whistle and he dropped the wood on his foot."

CO-OPERATION

Two negroes always worked together and so the tools they required were placed in one bag. One morning Rastus arrived before his companion and, feeling rather lazy, he pinned to the bag a note which read: "Dear Sam, have forgotten the tool-bag. Please bring it along."

When Sam arrived he read the note and was puzzled for a moment or two; then he turned the paper over and wrote this message: "Dear Rastus, Ah'm sorry, but Ah didn't see yo'note. Bring the tool-bag along yo'self."

* * * *

"Why have you your arm bandaged?"

"I broke it in two places."

"Tell me where they are, so that I can keep out of them."

* * * *

THE ONLY SOUND FEATURE

The young man drove his very ramshackle old car into the garage, and asked for information about a general overhaul. The mechanic gave the car a long and searching look and finally blew the horn, which responded nobly.

"That's a nice hooter you've got there, sir," he said. "Why not jack it up and run a new car under it?"

* * * *

"Did you give the goldfish fresh water?" asked the mistress of the new maid.

"No, mum," was the reply, "they have not drunk all I gave them a fortnight ago."

* * * *

"Did your watch stop, when you dropped it on the floor?"

"Of course it did. It isn't heavy enough to go right through."

* * * *

The braggart was, in his own opinion, a wonderful runner.

He was walking along the street with a friend who was getting tired of his boasting, when suddenly a gust of wind whipped off his friend's hat and carried it down the street. In spite of his friend's requests, however, he made no attempt to retrieve it.

"You can't be much of a runner, or you would try to get my hat," said the friend wrathfully.

"Just a second," replied the athlete, "I must give it at least a hundred yards start."

* * * *

A man who was wanted by the police had been photographed in six different positions and the pictures were sent out in the ordinary customary way to various police stations.

Nothing was heard for several days but eventually headquarters received a note from the chief constable of a town some distance away, which read: "I duly received the pictures of the six miscreants wanted. Five of them have been captured, and we are on the trail of the sixth."

* * * *

Employer: "Don't you feel well this morning, Jones? You look as though you haven't had a wink of sleep all night."

Jones: "No, sir, I haven't. My room mate and myself suffer from alternate insomnia."

Employer: "Alternate insomnia! I've never heard of it. Are you sure that is the right name?"

Jones: "Yes, sir, you see which ever of us gets to sleep first keeps the other awake."

ALL LEAP YEARS?

The much-travelled man was talking, and when he paused to take breath one of his listeners seized the opportunity and spoke.

"You say that in your favourite island in the South Seas you have each year 365 days of sunshine?" he began.

"I do, sir," was the traveller's reply. "And I might add that that is a very conservative estimate."

* * * *

Employer: "How was it you missed your train this morning?"

Employee: "The wretched thing came in on time, sir."

* * * *

The applicant for work had mentioned the wage he expected.

"But that's rather high," protested the prospective employer, who was rather amused at the man's audacity.

"Yes, but I don't know your work," was the reply, "and it will be so much harder for me."

* * * *

A dear old lady had been prevailed upon by a young relative to attend his school's sports. She was much interested in the tug-of-war, and closely watched several long tussles.

"Wouldn't it save a lot of trouble, dear," she said to her escort, "if they were to cut the rope in the middle?"

* * * *

Kind Gentleman (to little boy whom he has allowed to pick up windfalls): "Look out for the worms, sonny."

Boy: "When I eat apples the worms have to look out for themselves."

* * * *

Photographer: "Now put a pleasant expression on your face, please."

Man: "Will this do?"

Photographer: "Yes, perfectly."

Man: "Then take the photograph quickly, it hurts my face."

* * * *

Vicar (introducing new Churchwarden to old salt): "This is Mr. Smith."

Old Salt: "I know 'im quite well, sir. I saw him in church last Sunday. He was sleeping in the next bunk to me."

* * * *

STRANGE BUT TRUE

Onlooker: "What are you digging for, my man?"

Digger (taciturnly): "Money, sir."

Onlooker: "And when, pray, do you expect to find it?"

Digger: "Friday night."

* * * *

A man got a job on the railway, and his first task was at a goods yard running wagons down an incline. There was only a sleeper at the bottom to stop the wagons and the foreman told him to be careful to keep the brake on. On the third day four wagons went down at a terrific speed, jumped the sleeper and plunged into a canal.

The foreman rushed up, furious, but the man forestalled him.

"You needn't come grumbling to me," he said, "I've left."

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If you are interested in stamp-collecting, or want to start collecting, write for our FREE book, **Stamp Collecting—The World's Hobby.**

If you have not had them, ask also for our big lists of stamps and albums.

Approvals of any country on request.

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Actual contents of this wonderful offer:

MINT COLUMBUS STAMP
2 BLOCKS OF 4 LARGE AIRMAILS
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This beautiful very large unused Columbus stamp is a real work of art and should be in every collection. This fine offer also includes stamps from Ceylon, Cuba (Gomez), Australasians, Hivatalos, Egypt (Fuad), Wallis Isles, N.Z., 25 unused, and many other good varieties, **ALL FREE.** Just send 2d. for postage and request Approvals.

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I send FREE SIX MINT BRITISH COLONIALS, one each from KEDAH, ZANZIBAR, Kenya, TURKS & CAICOS Is., SOUDAN and CAYMAN ISLANDS—and ALL MINT, to any collector at Home or Abroad sending a postcard for my large Illustrated Price List (No. 9) containing over 1,200 items; Stamps, Albums, Sets, Packets, Accessories—in fact EVERYTHING FOR THE STAMP COLLECTOR. Prices from 1d. (over 200 sets at 1d. each) to 40/–. Send a postcard only—no cash—and ask for No. 200.

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Including Austria (**new pictorial**), Belgium (**Leopold Centenary**), **Bosnia** (unused), Chili (**1898 unused**), Ecuador (**1909 Commem. cat. 3d.**), F.M.S., Greece (**1930 Centenary**), Hungary (Charity), Japan, **Philippine Is.** (Boy King), **Salvador, Sp. Morocco** (1903), Turkey (**Pictorial**), Venezuela, etc. I will send this collection **absolutely free** to all Stamp Collectors sending 2d. postage. (Abroad 3d.). Only one gift to each applicant.

Mention 1931 offer.

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THE "ORIENTAL" PACKET

This packet contains **30** *good class* **Oriental stamps** only (no common continentals) and is mostly comprised of beautifully printed pictorials, views of towns, ruins, mosques, minarets, gateways, etc. Set of **Palestine.** Set of **Egypt** (large pictorial, King Fuad, etc.). Set of **Turkey** (including "Wolf" type). Set of **6 Algeria** (including 50c. and postage due). **Mesopotamia** (large pictorial). **Syria** (pictorial). **GRAND LIBAN** Pictorial (surcharged with Aeroplane for Air Service), Set of **3 Persia** (obsolete), **ALAOUITES** (Minaret). Set of **8 Tunis** (new issue, pictorials, postage due, etc.). **Price 4½d.** only, postage 2d. extra (abroad 2½d. extra). **Purchasers** of the above packet asking for approval sheets will be presented with a unique set of **10 PICTORIAL MOROCCO,** including Air post. This *fine* set is usually sold at a 1/–. Satisfaction guaranteed or money returned. Senders of addresses of stamp collecting friends will receive another set in addition **FREE.**

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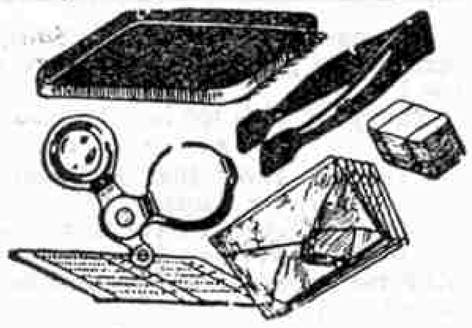

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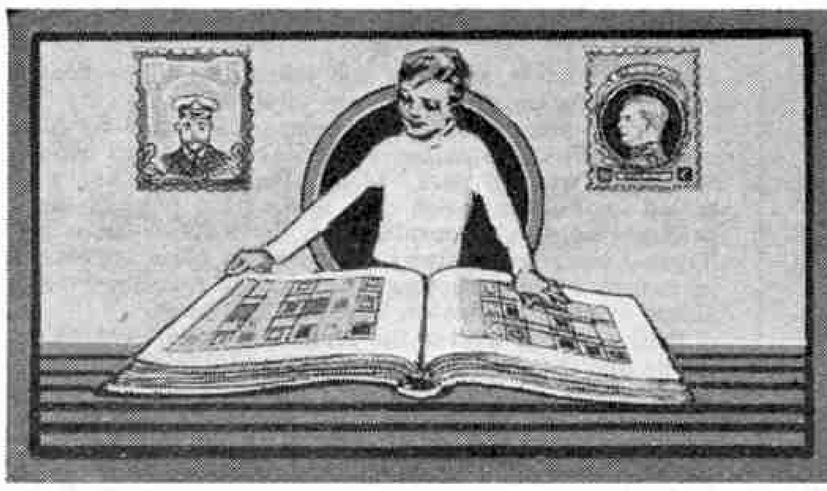

Stamp Collecting

STAMP COLLECTING AS AN INVESTMENT

WHEN rounding off our comments on starting stamp collecting last month, we promised to deal with the financial side of the hobby at an early date. We had in mind then that a stamp collection built on right lines can be an increasingly valuable asset, but it is well, first of all, to sound the warning that the young stamp collector who takes up the hobby with the sole idea of making money easily will meet with many disappointments. Certain financial gain comes only to those who can apply knowledge and skill to their collecting.

The young collector at the outset should regard his hobby simply as a form of amusement, and count the enjoyment he derives from it an adequate reward for his efforts. His early experience necessarily must be among the stamps that are his for the asking—for example, those provided by exchanges with chums or gifts from friends in business houses—and most of these stamps are so common that it is scarcely likely that they will ever attain any appreciable value, and if they do it will only be after the lapse of many years. Nevertheless, the experience gained from these common stamps will be invaluable when, ultimately, the collector finds that the only way of building up his collection quickly is by purchase from a stamp dealer, for it is then that the collector has it in his power to determine the investment value of his collection.

The secret of success is the ability to pick upon likely rarities—the term "rarity" being used in a comparative sense only, of course. It is unlikely that any modern stamp issue will attain the unique rarity of the 1c. British Guiana stamp of 1856, the only known specimen of which realised £7,000 when the famous Ferrari collection was broken up a few years ago, but it should be remembered that the demand for good stamps is increasing very rapidly with the growing interest that is being taken in stamp collecting. The boy of limited purchasing power obviously cannot compete with the wealthy collector for rare specimens of old issues, but he can keep his eyes open for specimens of modern issues that are likely to become rare.

An attractive design alone will not achieve a rise in value and, speaking generally, popular commemorative and charity issues will never command really good prices; their very popularity ensures a wide distribution and a perpetual lack of distinction.

The determining factor in the ultimate value of a stamp must be the quantity issued and the purpose of the stamp. A simple illustration will make this clear. In recent years, the United States have issued commemorative stamps at frequent intervals and in enormous quantities, tens of millions of each issue having been sold. Any of these stamps may be purchased to-day for 2d., and the price is likely to remain unaltered for many years to come.

Malta provides an interesting contrast, and reveals that there are modern issues of comparative rarity. In 1926, it was decided that the current postal issue should be no longer available for revenue stamp purposes, and pending a new general issue, the stamps were overprinted "Postage." It was known to a few people that stocks of the 4d. and 2/– values were very low and quickly they bought up all they could find. To-day those two stamps are valued at 8/6 and 50/– each respectively!

It is a good maxim to buy the highest values one can afford when buying for investment. Naturally, fewer high than low values are issued, and from an investment viewpoint it is better to buy a shilling value than 12 penny specimens. The penny values will fill plenty of space, but at best it will remain for the collector's great-grandson to reap the benefit of any rise in value! If very low values must be bought, it is best to buy blocks of four rather than single specimens.

An actual experience of mine in this connection illustrates the soundness of this plan. Six years ago a friend, home on leave from New Zealand, gave me the remains of a New Zealand stamp book containing blocks of four each of halfpenny and penny stamps, each block surrounded with stamp edging bearing advertising matter, for "Abdulla Cigarettes" in one case, and "Dainty's Biscuits" in another. There was also a single penny stamp, with advertising attached. I gave my friend seven English penny stamps in exchange for the whole lot. Last month I was offered 10/– for the two blocks, and only 3d. for the single specimen!

The collector who is watching the financial value of his collection must use an up-to-date catalogue; otherwise he may entertain strangers unaware. The most exciting incident of my collecting days occurred while glancing through a collection of photographs brought back from South Georgia by a friend who made a business trip to the whaling stations in 1928. To my surprise, I found in it a Falkland Island 2½d. on 2d. purple stamp. My friend, who is not a stamp collector, told me that he had placed the stamp there because he found it in his pocket book on arrival home, and looked upon it merely as a souvenir of his trip. He had the shock of his life when I told him that his simple souvenir was worth £40! He did not offer to give me the stamp.

Such strokes of luck rarely occur to a novice or to those who are not particularly interested in stamps, and the collector who knows most of his hobby gets most of the bargains. Speaking of bargains, however, young collectors would do well to avoid "bargain" packets of valuable stamps offered at ridiculous discounts from catalogue prices. Stamps dealers are keen business men. They are willing to help their customers all they can, but they do not give their stocks away deliberately. A good stamp will always command its value, and "valuable" stamps offered cheaply will rarely bear careful inspection. If there is a doubt, consult the Editor of the "*M.M.*"

Throughout this article we have endeavoured to stress the important fact that, apart from very rare flashes of fortune a financially successful collection can be built up only by those who give to the hobby as much attention as is given to every other activity in life in which success is desired. The boy who desires to top an examination list studies the books detailed in the syllabus. Similarly, the keen stamp collector makes a point of reading the literature devoted to his hobby to keep himself up-to-date in his knowledge.

There are many excellent publications devoted to philately, and its many different phases. Lack of space prevents the publication of a list of such periodicals but the Editor will gladly give full particulars to any reader who is interested.

100,000 STAMPS FREE!

SEND 1½d. Stamp as part-postage for our inimitable World-famous Approvals. Hundreds of hinge-mounted space-filler bargains. ALL LESS THAN ½d. each. Meccano readers amazed and delighted with the value and vast variety. Also we shall send you entirely FREE 1,000 ASSORTED STAMP HINGES, or 5 ICELAND (National Museum, etc.), or 100 diff. (inc. Syria, Liban and Alaouites). State which. Further, along with interesting LISTS, Catalogue, etc., will be included full details of the above gigantic gift-scheme.

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FREE! FREE!! FREE!!!

MINT TRIANGULAR FIUME,
SET GREECE WAR CHARITY,
MINT 1930 NEW ISSUES,
10 UNUSED COLONIALS,
25 DIFFERENT USED AND UNUSED.

A beautiful unused three-cornered ship stamp, Greece (wounded soldier), New Issues of Albania (pictorial) and Roumania (King Carol), Colonials from Travancore (surcharged), Soudan (camel), Transvaal (1d.), Haute-Volta, Madagascar, Congo, St. Pierre, Martinique, Caledonia, and Niger—every stamp unused; *also* 25 different superior stamps—**ALL FREE** to genuine approval applicants who enclose 2d. postage.

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THESE PRICES CANNOT BE BEATEN

*9 **Nyassa Triangles,** 1924, complete set ...	**6d.**
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9 **Roumania,** Boy King, complete set ...	**6d.**
4 **Belgian Congo,** 1920, Air Mails complete ...	**1/6**
100 **Diff. French Colonials.** Superior Stamps ...	**11d.**
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12 **Montenegro,** 1910, complete pictorial set ...	**9d.**

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25 Air Mail	7d.	25 Belgium Congo	1/5
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25 Brazil	6d.	25 Luxemburg	6d.
50 Finland	8d.	25 New Zealand	9d.
40 Norway	1/2	25 Soviet Russia	8d.
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25 Wurtemburg	7d.	9 Triangulars	9d.

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SPECIAL OFFER TO READERS

9 Roumania, "Boy King," **6d.**; 3 China, "Temple," **6d.** 10, Spain, "Pope and King," **1/–**; 10 Mongolia, used, **1/9**; 118 German Provisionals, **6d.**; 50 Siam, bargain, **2/6**; 32 Salvador, 1910, **2/6**; 25 Liberia, pictorial, **2/–**; 25, Haiti, used, **1/9**; 100 Poland, **1/–**; 9 Greece, Commemorative, **6d.**; 50 Air Mail Stamps, **2/–** 100 Good Stamps in Linen-hinged Leatherette Duplicate Book, **2/6**. One only to each Applicant.

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sheets are at your disposal. For 51 years we have made a speciality of sending out sheets of stamps on approval. Ask to see some and compare the quality and prices with those of other firms. To all applicants enclosing 1½d. for postage we will present, gratis, a set of 4 Trinidad and Tobago stamps if the application is addressed to **Department 90,**

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South Hackney, London, E.9. Established 1880.

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Ten Triangular Stamps, 1/-

50 French Colonials	**9d.**
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M. REGIND, 74, Swanage Road, Southend-on-Sea.

1000 DIFFERENT STAMPS 1000

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from which you may select any 100 for 3/–. This selection is **not** made up of the thousand commonest stamps, but contains specimens priced by Stanley Gibbons up to 1/– each. For 3/– you have the opportunity of choosing 100 stamps of the catalogue value of 20/- or more.

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FREE. 100 superior stamps to approval applicants. Gosling, 91, Foxhall Road, Ipswich.

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COLLECTOR'S APPROVALS at ½ marked (Cat.) Prices. Many at less. Commoner or Medium Var.—G. Nicholson, 46, Russell Street, Reading.

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2/6 and 5/– K.G. Great Britain for 6d. post free to applicants for Selected British Colonial Stamps at ½d. each.—E. W. Small, 32, Downhills Park Rd., N.17.

"1931 Packet" of 31 diff. mint Syrian Stamps includ. **Air Mail,** at **1/6 Post Free.** Also **25 Oriental Stamps Free** to Approval Applicants. Buy from source.—**K. Aboul-Zahab, "Al-Saifi," Beirut, Syria.**

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Over £1 for only 3/6

Send for full particulars and surprise GIFT FREE.

GEORGE LAZENBY,
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ENGLISH £1 AND 10/- STAMPS.

These two stamps (issued and used for a special fiscal purpose) with eight others, including one nearly **90 YEARS OLD** and other **OLD** English postage stamps **GIVEN AWAY** free of charge to genuine applicants for selections of duplicate stamps on approval. 500 different stamps (extra good), **1/6.**

HENRY TURNER,
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"MECCANO MAGAZINE" BINDERS

There is no better way of keeping your Magazines clean and tidy than by binding them in one of the special binders we supply.

These binders have strong stiff backs, covered with black imitation leather, tastefully tooled, and are lettered in gold. The large binder holds 12 Magazines—price 4/6 post free. The small binder holds 6 Magazines—price 3/– post free. Meccano Ltd., Old Swan, Liverpool.

A Great Bookshop

Our readers, accustomed as they are to statistics and big figures, will have some difficulty in appreciating what it means to have always over a million books in stock!

The average home bookcase rarely holds more than 100 volumes. Imagine a row of 100 such bookcases and then 100 such rows, and—well, that will convey a hazy idea of the vastness of the stock that is housed in Charing Cross Road, London, W.C.2, by W. & G. Foyle Ltd.

Foyle's stock of secondhand books alone is probably the greatest in the world, and the number of these is so great that each of nearly 30 distinct departments finds it necessary to issue an individual catalogue, and, in addition, special lists of the best books in its own sphere.

We have just received from Messrs. Foyle a copy of their catalogue of juvenile books, comprising 32 pages of helpful lists of books suitable for presents and prizes. Our advertisers offer a copy to any of our readers who are interested, but requests must mention the "*M.M.*" and specify Catalogue No. 1d.

Conquering a Desert—(*Continued from page 111*)

Railway, and in some of the latest stock the centre girder underframe has been adopted. Up to the present no steel bodies have been constructed for this railway. The Australian travelling public are accustomed to wooden cars. Australian timbers are well suited for building such cars, and at the present time, taking weight into consideration the costs so far as the Trans-Australian Railway is concerned are a good deal in favour of constructing at the Port Augusta workshops wooden bodies on steel underframes.

Both east and west of the Trans-Australian 4 ft. 8½ in. gauge line there are railway systems of 3 ft. 6 in. gauge. This entails breaks of gauge separating the terminals of the line from the capital cities in the east and west of the Continent, and constitutes a serious handicap to the free movement of traffic from coast to coast. The Federal Government proposes to overcome these difficulties by providing an extension of 4 ft. 8½ in. gauge from Port Augusta to Adelaide. The carrying out of this proposal will not only avoid change of trains by passengers and the costly transference of mails and goods, but also will shorten the distance between Port Augusta and Adelaide by 70 miles, saving approximately nine hours on the trans-continental trip. The time taken on the run of 1,051 miles is 37½ hours, inclusive of stops, giving an overall average speed of 28 miles per hour which, taking into consideration the fact that the ruling gradient is 1 in 80, is quite creditable.

In addition to founding a new sheep-grazing country, the railway has opened up one new goldfield and at least one new copperfield. It has reduced the time of the journey from Perth to Melbourne from five days to two days, and it is over this line, which cost £7,000,000 to lay, that the Imperial mails are carried. It will be recalled that when the Prince of Wales visited Australia he journeyed over the great desert line. Unfortunately his coach left the rails when the train was actually in the desert, but to the relief of his party, and to the joy of the whole civilised world, the Prince escaped injury.

Famous Aeroplanes—(*Continued from page 129*)

of the Mark II, is 125 m.p.h., while its cruising speed is about 110 m.p.h. It is interesting to note that the cost of petrol and oil works out at less than one half-penny per person per mile! The machine lands at from 45 to 50 m.p.h. and climbs to 1,000 ft. in one minute. Its ceiling varies between 17,000 ft. and 20,000 ft. The tanks hold 30 gallons of petrol and 2¼ gallons of oil, giving the aeroplane a range of 5 hours or 500 miles.

The de Havilland "Gipsy III" engine, with which the Desoutter Sports Coupé is equipped, is of the four-cylinder, inverted, air-cooled, direct drive, type. It has a bore of 114 m.m., or approximately 4.5 in., and a stroke of 140 m.m., or about 5.5 in. The capacity of the engine is 5,716 c.c. The normal power developed by the "Gipsy III" is 108 to 110 b.h.p. at 2,000 r.p.m., but it is rated at 105 b.h.p. at 2,000 r.p.m. Its maximum b.h.p. is 120 at 2,200 r.p.m. The compression ratio is 5.2 to 1, while the weight complete with airscrew boss and usual fittings is 285 to 290 lb.

The engine consumes 6.5 gallons of petrol every hour when running at 9/10th throttle and 2,000 r.p.m. When being employed at full throttle the consumption rises to nine gallons per hour. The oil consumption is only one pint per hour, and the oil is maintained at a pressure of from 40 to 45 lb. per sq. in.

The Collis Truck—(*Continued from page 137*)

drawings will be returned to the sender if a stamped addressed envelope of the necessary size is sent with the entry, except in the case of prize-winning entries, which become the joint property of J. Collis & Sons Ltd., and Meccano Ltd.

6. Entries will be divided into three sections, as follows:—Section A, for boys over 14 years of age, living in the British Isles. Section B, for boys under 14 living in the British Isles. Section C, for Overseas competitors of all ages. The list of splendid prizes offered is shown in the panel on page 136.

7. Each separate photograph or drawing submitted must bear the competitor's name, address, age, competition section (A, B, or C), and name of the Contest ("Collis Truck" Competition). Envelopes containing entries must be addressed "Collis Truck" Competition, Meccano Ltd., Old Swan, Liverpool.

8. The entries will be judged jointly by J. Collis & Sons Ltd., and Meccano Ltd.

9. The closing dates for the competition are as follows:—Sections A and B, 30th April, 1931; Section C, 31st July, 1931. The results will be published in the "*M.M.*" as soon after the closing dates as possible, and the principal prize-winning models will be described and, if possible, illustrated.

COMPETITION RESULTS

OVERSEAS

August Crossword.—1. J. McG. Webb (Wellington, N.Z.); 2. N. Burt (Nelson, N.Z.); 3. MacL. Morgan (Sydney, N.S.W.); 4. W. A. Parker. (Bulawayo, S. Africa). Consolation Prizes: C. W. Sharpe (Nelson, N.Z.); R. A. Wragg (Bandikui, India).

August Photographic Contest.—First Prizes: Section A, R. Bandiera (Fiesole, Italy); Section B, J. D. Siddons (Wainwright, Alta.); Second Prizes: Section A, Wm. Govan (Toronto); Section B, Miss S. Savithri (Madras).

Stamp Gossip

and Notes on New Issues

South African Air Mail

As announced in the "Air News" on page 130 of the present issue of the "*M.M.*" the first through flight from London to Mwanza on the South African air service of Imperial Airways will leave London on 28th February and arrive at Mwanza on 8th March, while the first northward flight from Mwanza to London will commence on 10th March, arriving in London on 18th March.

As far as is known at present, mail will be carried both to and from all intermediate stations on the first services. It is possible that one or more of the stations may be excluded, but no information is yet available on this point. The surcharges for air mail matter have not yet been fixed by the Postal Authorities concerned, but it is anticipated that the maximum surcharge will not exceed 6d. per half-ounce, in addition to ordinary postage.

Imperial Airways are prepared to arrange for the despatch of both southbound and northbound mail between certain points, and also for the subsequent recovery of air mail covers from their destinations.

Collectors desirous of using these facilities should write immediately to Imperial Airways Ltd., Charles Street, Lower Regent Street, London, S.W.1, for full details of the conditions. It is important to write immediately, for covers intended to be handled by Imperial Airways must reach them not later than 12th February.

Australian Postal Changes

The recent changes in the Australian postal rates bring in their train a number of provisional issues. The first to make its appearance is the 2d. on 1½d. red, for ordinary mail, and a 5d. on 4½d. to cover the new registration rate.

The 5d. denomination has not been in use for several years and its re-introduction now will involve the preparation of new printing plates and, probably, minor differences from the earlier design. The existing 4½d. denomination is to be withdrawn, for it will not be required further. A new postage due, 4d. denomination, is to be introduced also.

We take this opportunity of making acknowledgment to Stanley Gibbons Ltd., for their courtesy in loaning the stamps from which the illustrations used in our stamp pages have been prepared.

Charity Issues of 1930

Apart from their sentimental associations, one has come to look forward to the annual Christmas charity stamp issues for the interest of the designs and the stamp stories they tell. Our illustrations this month are drawn almost exclusively from this source.

The Swiss Pro Juventute issues, although disappointing in comparison with last year's designs—we understand that the pictorials that were so strikingly successful last year are to be produced in alternation with the arms type—have several features of interest. The lower values, 5c, 10c., and 20c., feature respectively the arms of the city of Fribourg, Altdorf, the capital of the Uri canton, and Schaffhausen. The 30c. rectangular stamp shows Albrecht Bitzuis, a very popular 19th century Swiss novelist, who is better known under his pen name *Jeremias Gotthelf*.

While Switzerland announced her charity issue with intense publicity, Belgium has allowed her anti-tuberculosis fund issue to appear almost unheralded. There are seven stamps, each depicting one of Belgium's many famous castles. There is not space to illustrate more than one specimen, the Wynendaele Castle, on the 25c. +15c. value. The series is not as well produced as Belgium's previous Christmas charity stamps, but, nevertheless, it is a good production that will sell well.

Holland has chosen an allegorical series depicting the four seasons of the year, as follows:—Spring 1½c. +1½c.; Summer, 5c. +3c.; Autumn, 6c. +4c.; and Winter, 12½c. +3½c. This Child Welfare series is one of the best that Holland has issued. A special issue for similar charities has been prepared for Holland's East Indian Colonies, the four stamps showing native scenes, a Bali Temple on the 2c., a watch tower, as illustrated, on the 5c., a native compound at Menangkabo on the 12½c. and a Brahmin temple on the 15c.

Latvia has issued a long set of 10 values for its anti-tuberculosis campaign, and from this we illustrate the 25-50s. value. Luxemburg, following its custom of recent years, uses a portrait of a Royal prince, each of five values bearing a likeness of Prince Charles, the youngest member of the family. Uruguay appeals for its "poor old people" with four values, each bearing the design illustrated.

* * * *

Another new issue of Turkish stamps may be looked for shortly. A British firm of printers have the order in hand for early delivery, but details of the issue are not available yet.

The Gibbons Air Mail Catalogue

Interest in stamp and other postal matters connected with the progress of aviation, has increased very rapidly in the past few years, and, as we indicated in our advance note in the December "*M.M.*," Stanley Gibbons Ltd. are meeting a very real need in introducing their air mail catalogue.

The catalogue lists only official Government issues; first flight covers, cachets, unofficial and private issues, of necessity have had to be left out—their importance involves vastly more research than could be undertaken in connection with a popular handbook—but articles on the history of aero-philately, a general outline of sound working methods in forming a collection of aero-philatelic pieces, a brief survey of the financial possibilities and a cross-reference for each stamp to link up with the Gibbons general stamp catalogue, are important adjuncts that make the catalogue a valuable guide.

Air transport is in its infancy. As it develops it will attract an increasing army of aero-philatelists, many of them not in the least interested in ordinary stamp collecting, and the prices of early pieces must soar. Stamp collecting readers would be well advised to hold tight to every piece of air mail material they possess. Even if it appears commonplace to-day, it may become valuable in later years.

Another Newfoundland Rarity

The Newfoundland Post Office issued a special 50c. air mail stamp to frank the mail carried on the second successful trans-Atlantic flight of the American aeroplane "*Columbia*" on 9th-10th October last. The stamp actually was a 30c. "Caribou" issue surcharged and overprinted for the occasion.

Only 300 copies were issued and it may reasonably be expected that before many years have passed this stamp will have become as valuable as the Newfoundland "Hawkers" and "Pinedos," the star pieces of aero-philately.

Change of Business Name

Many of our older readers, and particularly those who are keen stamp collectors, doubtless will have noted with some surprise the disappearance of Messrs. North Brothers' advertising from our stamp columns, after an association extending back for more than seven years. The explanation is that Mr. North's business is now known and advertised as the Central Stamp Club.

HORNBY SERIES

HORNBY ROLLING STOCK

GAUGE 0

Hornby Rolling Stock includes almost every type in use on the big railways, and a selection of the splendid range available is illustrated on this page. The various items are modelled on realistic lines, strongly built and beautifully enamelled.

Ask your dealer to show you the full range of Hornby Rolling Stock.

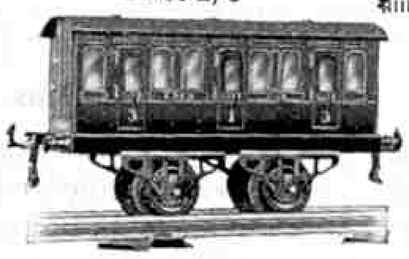
PETROL TANK WAGON "PRATTS"
Beautifully finished.
Price **2/6**

PETROL TANK WAGON "B.P."
Finished in yellow.
Price **2/6**

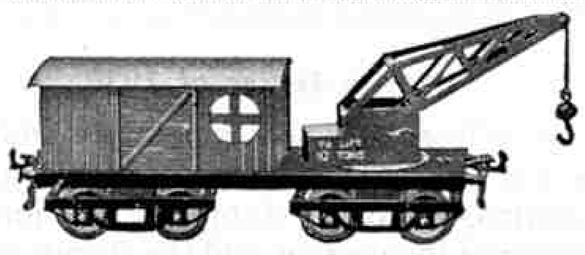
PETROL TANK WAGON "SHELL"
Finished in red.
Price **2/6**

OIL TANK WAGON "CASTROL"
An attractive model. Enamelled green with lettering in red. Price **2/6**

BRAKE VAN (French Type)
Lettered "Nord." Beautifully finished in colours. Opening doors. Price **4/-**



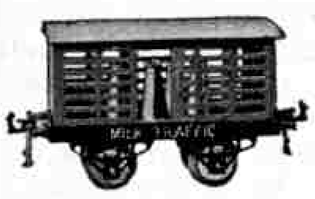
***HORNBY No. 1 PASSENGER COACH**
Realistic in design and fitted each side with opening doors. Price **2/6**



***BREAKDOWN VAN AND CRANE**
Beautifully coloured in brown and blue, with opening doors. Suitable for 2-ft. radius rails only. Price **6/3**

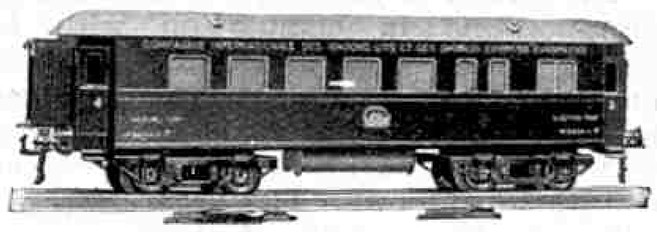
GUARD'S VAN
Realistic design, fitted each side with opening doors. Obtainable in L.N.E.R., L.M.S., G.W. or S.R. colours. Price **3/-**

WAGON (French Type)
Lettered "Nord."
Highly finished in colours. Price **3/3**

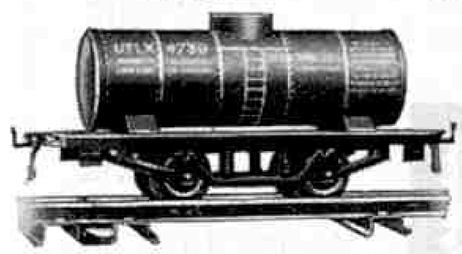


MILK TRAFFIC VAN
Fitted with sliding doors. Complete with milk cans.
Price **3/6**

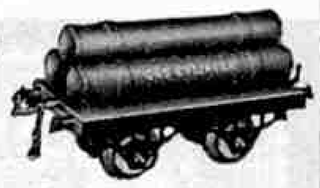
COACH (American Type Pullman)
Coloured green or yellow and named either "Madison" or "Washington." Price **1/6**



RIVIERA "BLUE" TRAIN COACH
"Dining" or "Sleeping."
This is a beautiful model, substantially built and well finished. Suitable for 2-ft. radius rails only.
Price **14/-**



TANK CAR (American Type)
Model of the type of tank car used in America for the conveyance of oil, etc.
Price **1/9**

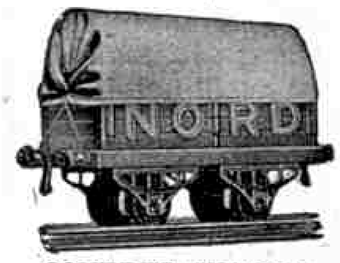


GAS CYLINDER WAGON
Finished in red, lettered gold. Price **2/6**

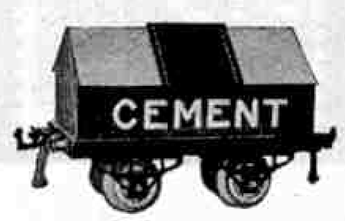
SIDE TIPPING WAGON
Excellent design and finish. Lettered "Robert Hudson Ltd." Price **2/6**

WINE WAGON, SINGLE BARREL
An interesting model of the single-barrel type of wine wagon used in France. Finished in red and green.
Price **4/-**

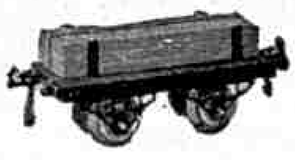
COACH, No. 2 SALOON
Realistic in design and beautifully finished. Two types are available: L.M.S. (as illustrated) enamelled maroon, and L.N.E.R. enamelled brown. Suitable for 2-ft. radius rails only.
Price **11/6**



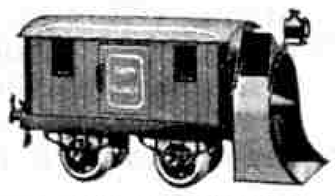
COVERED WAGON (French Type)
This wagon is fitted with frame and sheet. French type, lettered "Nord." Price **3/-**



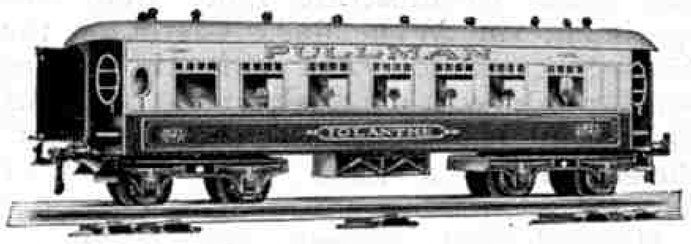
CEMENT WAGON
Finished in red.
Price **3/-**



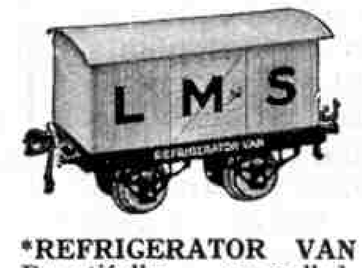
TIMBER WAGON No. 1
Beautifully enamelled in green and red. Price **1/9**



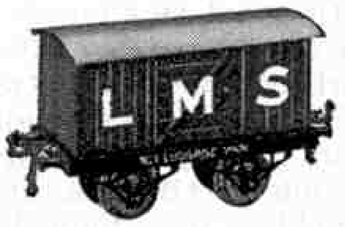
SNOW PLOUGH
With revolving plough driven from front axle.
Price **5/6**



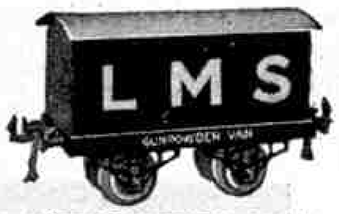
HORNBY No. 2 SPECIAL PULLMAN COACH
As supplied with No. 2 Special and No. 3 Pullman Train Sets. This splendid coach is perfect in detail and finish. Suitable for 2-ft. radius rails only. Price **15/-**



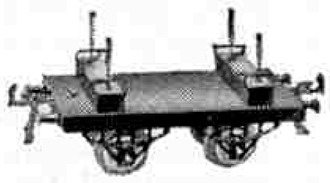
***REFRIGERATOR VAN**
Beautifully enamelled. Fitted with opening doors.
Price **3/9**



***LUGGAGE VAN No. 1**
With opening doors.
Price **3/6**

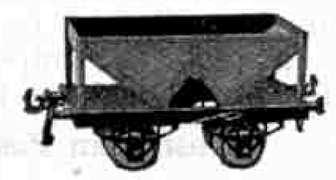


***GUNPOWDER VAN**
Finished in red. With opening doors. Price **3/6**



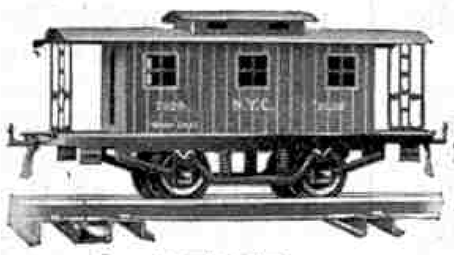
LUMBER WAGON No. 1
Fitted with bolsters and stanchions for log transport. Price **2/-**

TROLLEY WAGON
Finished in brown and blue. Suitable for 2-ft. radius rails only. Price **4/6**

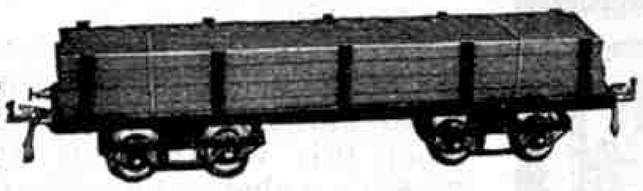


***HOPPER WAGON**
Mechanically unloaded. Finished in green. Price **3/6**

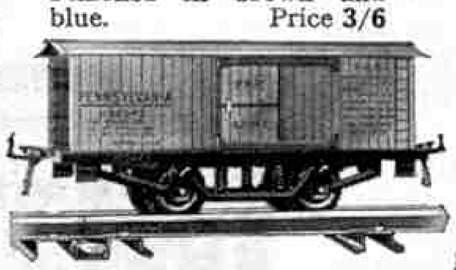
BITUMEN TANK WAGON "COLAS"
Finished in blue.
Price **5/3**



CABOOSE
Modelled on the type of brake van used on American railroads. Price **2/6**



TIMBER WAGON No. 2
Beautifully enamelled in green and red. Suitable for 2-ft. radius rails only. Price **3/6**

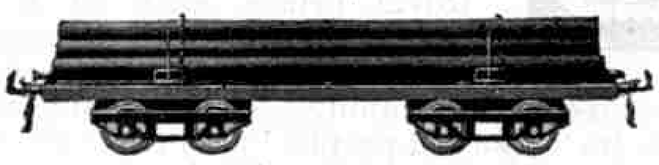


BOX CAR
This is a model of the type in use on American railways. Price **2/6**

MILK TANK WAGON "UNITED DAIRIES"
A very realistic model, finished in blue and white. Price **6/-**

JACOB'S BISCUIT VAN
Finished in crimson lake. With opening doors.
Price **3/6**

CARR'S BISCUIT VAN
Finished in blue. With opening doors. Price **3/6**



LUMBER WAGON No. 2
Fitted with bolsters and stanchions for log transport. Suitable for 2-ft. radius rails only.
Price **4/-**

CRAWFORD'S BISCUIT VAN
Finished in red.
Opening doors. Price **3/6**

SECCOTINE VAN
Beautifully finished in blue. With opening doors.
Price **3/6**

In L.M.S., L.N.E.R., G.W., or S.R. lettering.

Manufactured by MECCANO LIMITED, BINNS ROAD, OLD SWAN, LIVERPOOL

HORNBY SERIES

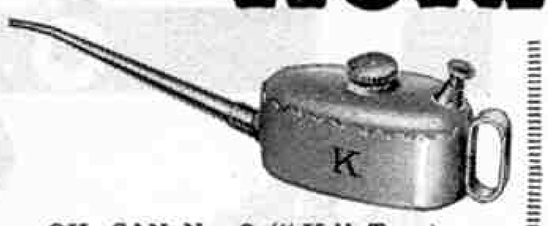
HORNBY ACCESSORIES

HORNBY SERIES

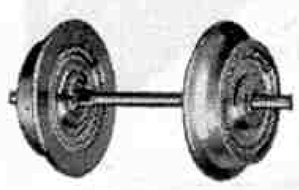
There is a splendid range of Railway Accessories in the Hornby Series, built in perfect proportion and beautifully finished. With these realistic Accessories the most elaborate model railway system may be constructed and operated in exactly the same manner as a real railway.

A selection of Hornby Accessories is illustrated below. Your dealer will be pleased to show you the full range.

DOUBLE ARM SIGNALS No. 1
Price 4/3 per pair.
DOUBLE ARM SIGNAL No. 2
(As illustrated.)
Price 3/- each.



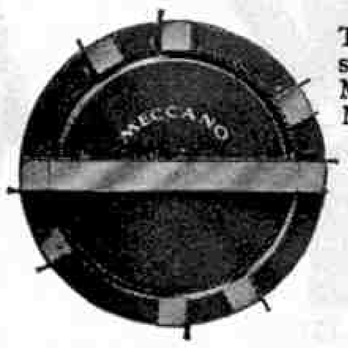
OIL CAN No. 2 ("K" Type)
This miniature Oil Can operates perfectly. The oil is ejected drop by drop by depressing the valve. Polished Copper. Price 3/6



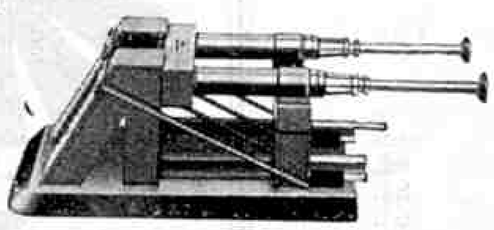
MANSELL WHEELS
These solid die-cast wheels are correctly designed and may be fitted to Hornby Wagons, Vans, Coaches, etc. Price, per pair, 4d.

M STATION SET, 7 pieces
Price complete, 3/6
The components of the M Station Set may be purchased separately as follows:—M Wayside Station. Price, each, 1/-
M Signal Box ... Price, each, 6d. M Signals ... Price, each, 4d.
M Station ... Price, each, 1/3 M Telegraph Poles. Price, each, 4d.

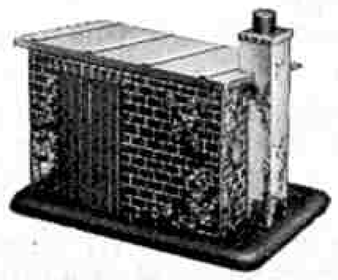
TARPAULIN SHEET
Strongly made. Lettered L.M.S., G.W., N.E. or S.R. The above illustration shows one of the Tarpaulin Sheets fitted to a Hornby Wagon. Price 3d.



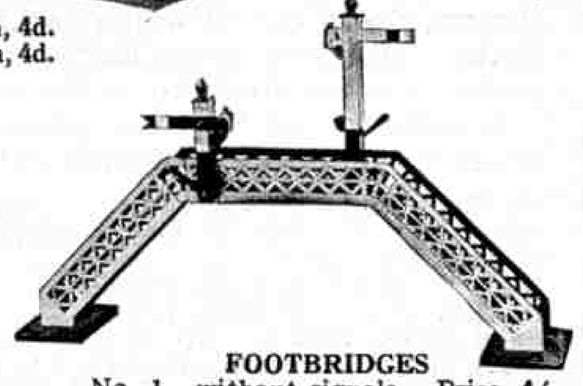
TURNTABLE No. 2
Price 4/6
TURNTABLE No. 2 (Electrical)
Similar to Turntable No. 2, but fitted with electrical rails ... Price 8/6



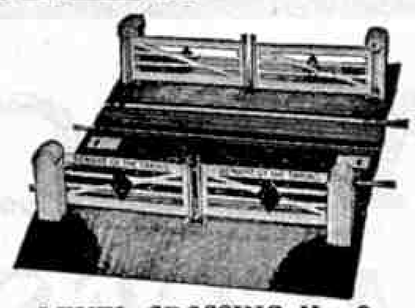
BUFFER STOPS No. 2 (HYDRAULIC)
Price 5/6



PLATELAYER'S HUT
Price ... 2/6

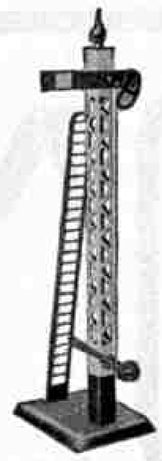


FOOTBRIDGES
No. 1, without signals. Price 4/-
No. 1a, with detachable tin-printed signal posts and arms ... Price 4/9
No. 2, with detachable enamelled signal posts and arms (as illustrated). Price 7/6
Signals only, for No. 2 footbridge. Price ... ... per pair 3/9



LEVEL CROSSING No. 2
Measures 13½ × 10½ ins., with two tracks of gauge 0 rails in position ... ... Price 5/6

LEVEL CROSSING No. 2 (Electrical)
Similar to Level Crossing No. 2, but fitted with two electrical tracks ... ... Price 8/-



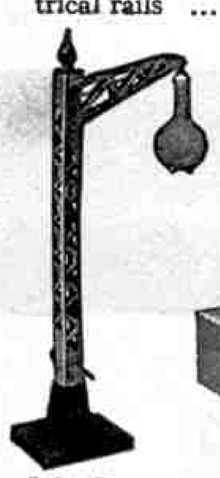
SIGNAL No. 2
Price 2/6 each. "Home" or "Distant."

TUNNEL
Realistic and finished in colours ... Price 7/6

RAILWAY ACCESSORIES No. 8
Notice Boards.
Price, per set, 2/3

SIGNAL GANTRY
This is a very realistic model, the signal arms of which are operated by levers at the base of the standards. Attractively finished in colours. Price 10/-

SIGNAL CABIN No. 1
Dimensions: Height 6 ins. Width 4½ ins. Length 6 ins. Finished in colours ... Price 2/9

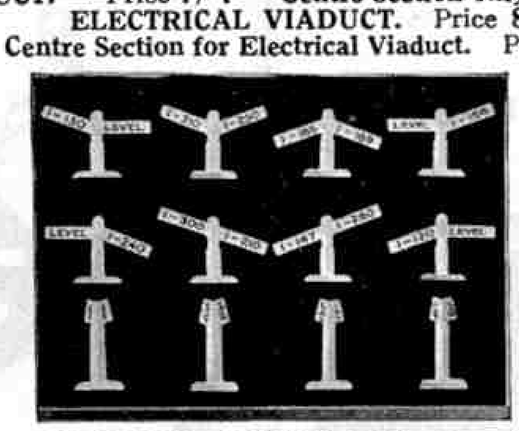


LAMP STANDARD No. 1 (SINGLE)
An electric flash-lamp bulb may be fitted into the globe. Price 3/6

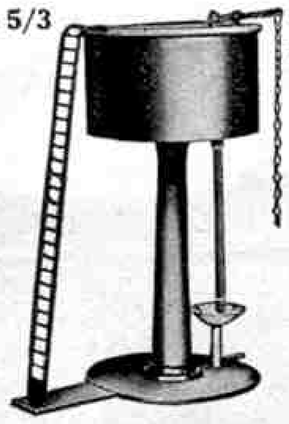
GOODS PLATFORM
Length 16¾ ins. Height 6¾ ins. Width 6 ins. The crane at the end of the platform revolves on its base. It is enamelled in colours and is fitted with a crank and ratchet mechanism for controlling the load ... ... Price 12/6

VIADUCT. Price 7/-. Centre Section only. Price 4/9
ELECTRICAL VIADUCT. Price 8/-
Centre Section for Electrical Viaduct. Price 5/3

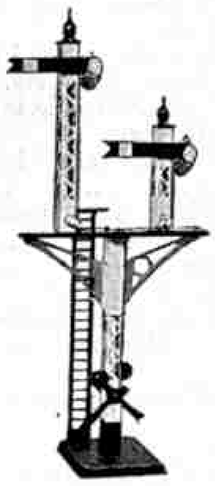
RAILWAY ACCESSORIES No. 7
Watchman's Hut, Brazier, Shovel and Poker ... Price 1/6



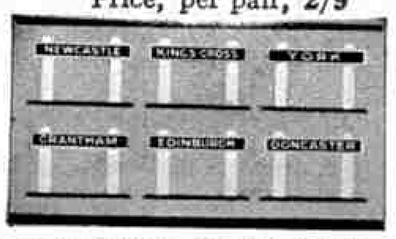
RAILWAY ACCESSORIES No. 5
Gradient Posts and Mile Posts. Price 2/-



WATER TANK
Brightly coloured. Fitted with flexible tube and valve lever. Price 8/6

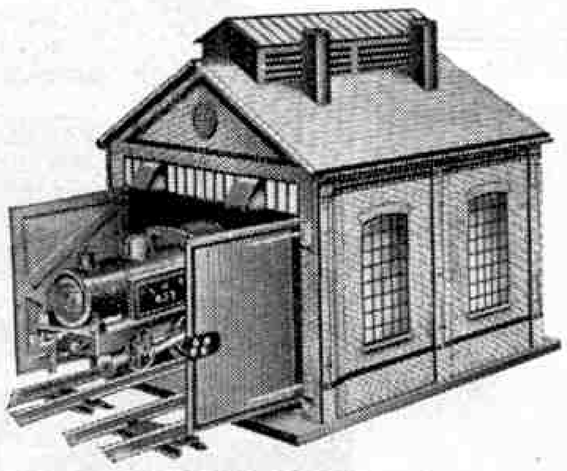


JUNCTION SIGNAL
"Home" or "Distant." Signal arms operated by levers at base. Very realistic model, standing 14 ins. in height. Price 6/-



RAILWAY ACCESSORIES No. 9
Station Name Boards.
Price, per set, 2/6

RAILWAY STATION No. 2. Excellent model, beautifully designed and finished. Constructed in three sections, which are detachable. Dimensions: Length 2 ft. 9 ins., breadth 6 ins., height 7 ins. ... ... Price 12/6



ENGINE SHED No. 1
This Shed is beautifully finished in realistic colours. It will accommodate Locomotives and Tenders of the M series, and Locomotives of No. 0 and No. 1 types ... ... Price 15/-

MECCANO ACCESSORY PARTS

Boys! Build Bigger and Better Models

It is the ambition of every keen Meccano boy to build bigger and better models. That is why he constantly increases the scope of his Outfit by adding more parts.

There are over 250 real engineering parts in the Meccano system, every one of which can be obtained from any Meccano dealer. Ask your dealer for a complete illustrated list of Meccano parts, or write direct to us for a copy.

A selection of Meccano parts is shown on this page. The prices of these are indicated below.

No. 20b. Flanged Wheels, ¾" diam. Designed to fit over the end of the Sleeve Piece (part No. 163) to form a complete cylinder unit. They also form excellent belt pulleys ... ... Price **4d.**
No. 25a. Pinion, ⅜" diam., ⅛" wide ... ... „ **8d.**
No. 26a. „ ½" diam., ⅛" wide ... ... „ **6d.**
Bevel Gears. Part No. 30a (½" diam.) and Part No. 30c (1½" diam.). These Gears, in mesh, give a speed ratio of 3 to 1 for which one of each part should be used. Neither 30a nor 30c will mesh with a like part, but only with each other.
No. 30a ... ... Price **6d.** No. 30c ... ... Price **1/6**
No. 62b. Double Arm Cranks. May be used as a reinforced bearing for shafts, etc. ... ... Price **3d.**
No. 116a. Fork Pieces, small. Designed for pivotal connections between Rods and Strips ... ... Price **3d.**
*No. 138a/z. Ships' Funnels. Raked type, oval section ... ... „ **9d.**
No. 150. Crane Grab. For use in place of the ordinary crane hook. „ **7d.**
Pulley Blocks. These pulley blocks may be used with advantage in model cranes, derricks, boat davits, etc.
No. 151 ... Price **8d.** No. 152 ... Price **9d.** No. 153 ... Price **1/–**
Nos. 154a and 154b. Corner Angle Brackets, Right Hand and Left Hand. For use in cases where two ½" × ½" Angle Brackets bolted together would prove either too cumbersome or insufficiently rigid ... ... Price ½ doz. **6d.**
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No. 157. Fan. Suitable for use as a radiator cooling fan in model motor cars, etc. ... ... Price **4d.**
No. 158a. Signal Arm, "Home" Type ... ... „ **5d.**
No. 158b. Signal Arm, "Distant" Type ... ... „ **5d.**
No. 159. Circular Saw. For use in wood-sawing machinery ... „ **1/–**
No. 160. Channel Bearing. Designed to form a rigid bearing for Axle Rods, etc. ... ... Price **2d.**
No. 162. Boiler. Fitted with movable ends ... ... „ **1/–**
No. 162a. Boiler Ends ... ... „ **3d.**
No. 162b. Boiler without ends ... ... „ **6d.**
No. 163. Sleeve Piece. Forms an excellent cylinder ...Price per pair **6d.**
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No. 165. Swivel Bearing. Designed to couple two Rods together, end to end Price **6d.**
No. 166. End Bearing. May be used for pivotally coupling a Rod and a Strip end to end ... ... Price **3d.**

* *The series includes 26 funnels in the correct designs and colours of leading shipping companies.*

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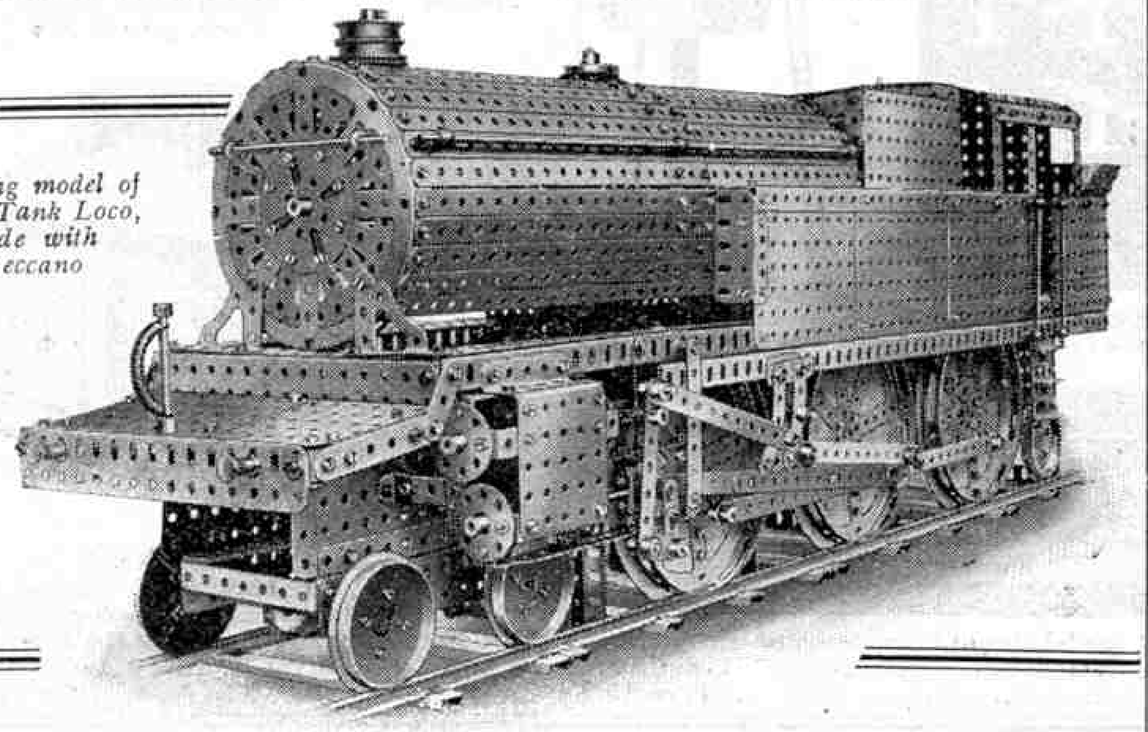
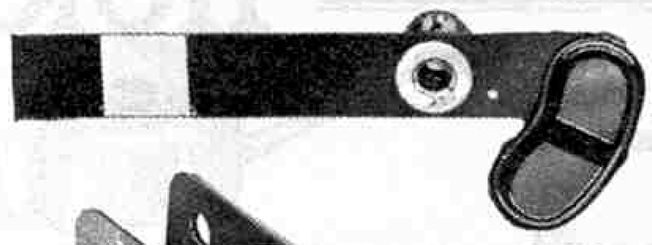


Working model of Baltic Tank Loco, made with Meccano

No. 154a


No. 158a

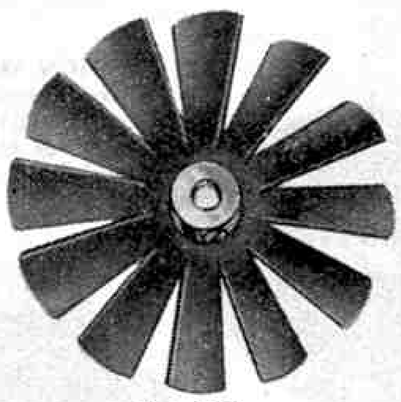
No. 154b

No. 160

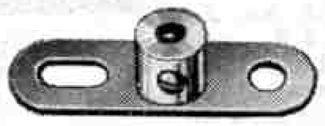
No. 165

No. 156

No. 153

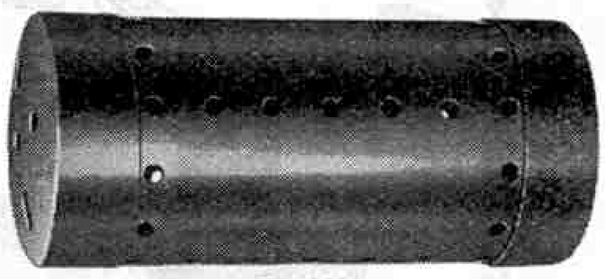

No. 157

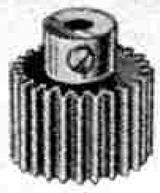
No. 159


No. 62b

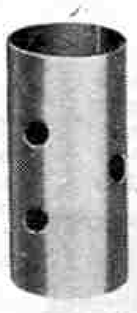
No. 116a

No. 152


No. 162


No. 25a

No. 166


No. 163

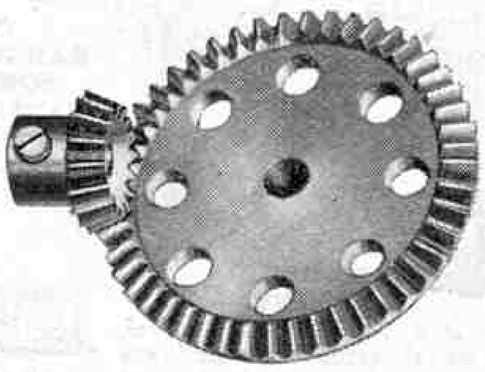
No. 151

No. 150

No. 138a/z

No. 20b

No. 164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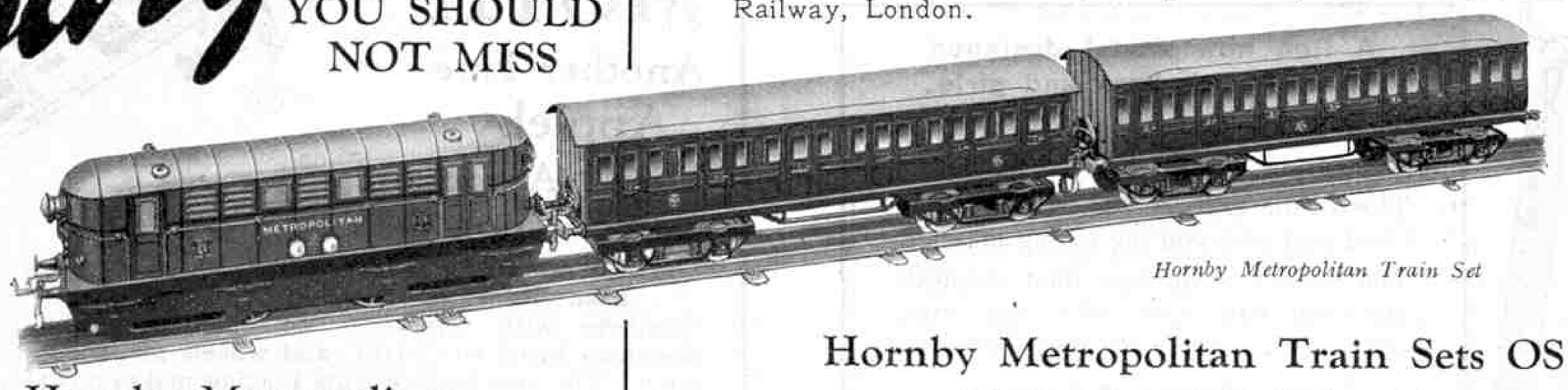

Hornby Metropolitan Train Set

Hornby Metropolitan Locomotives OS

THE CLOCKWORK MODEL OS is fitted with reversing gear and brake mechanism, which may be controlled from the cab or, if a Control Rail is employed, from the track.
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THE ELECTRIC MODEL OS is fitted with a 4-volt electric motor which is operated from a 4-volt Accumulator or from a Transformer connected to the main (alternating current only).
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(Clockwork and 4-volt Electric)

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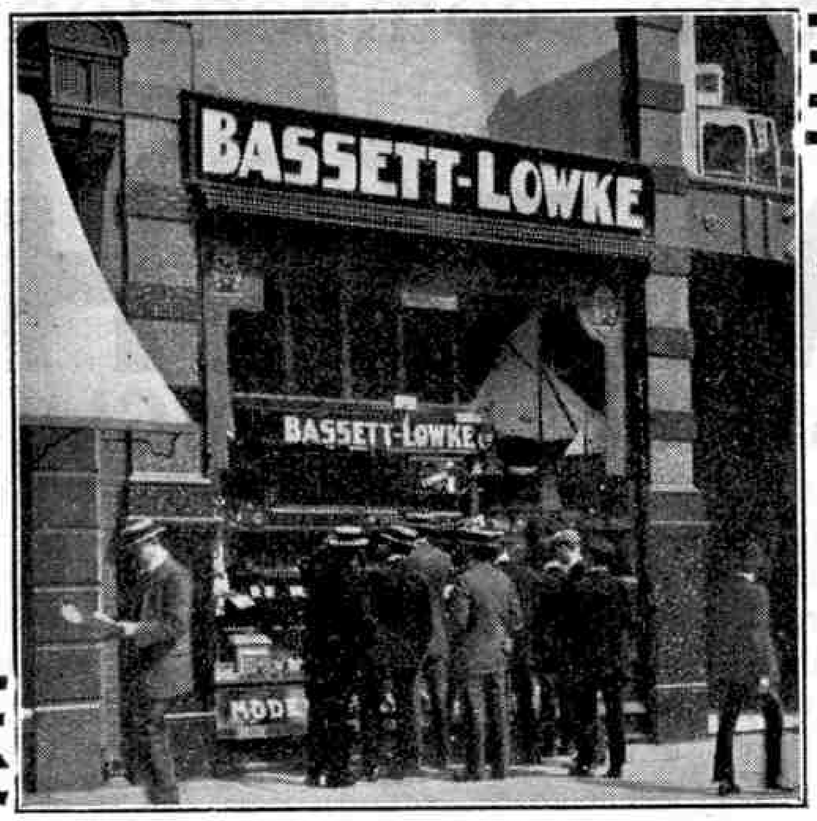

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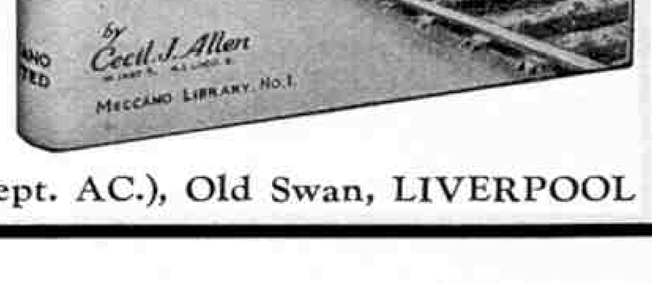
This book tells the story of some of the most famous expresses of Great Britain. The author, Mr. Cecil J. Allen, is one of the best-known writers on railway matters, and his lectures and B.B.C. talks are always popular. His present contribution will be of great interest to all who are interested in railways. The Book is beautifully printed on art paper, cloth bound, and is fully illustrated throughout. It may be obtained from any Meccano dealer or any newsagent, price 2/6, or direct from Meccano Ltd., Old Swan, Liverpool, price 2/9 (post free).



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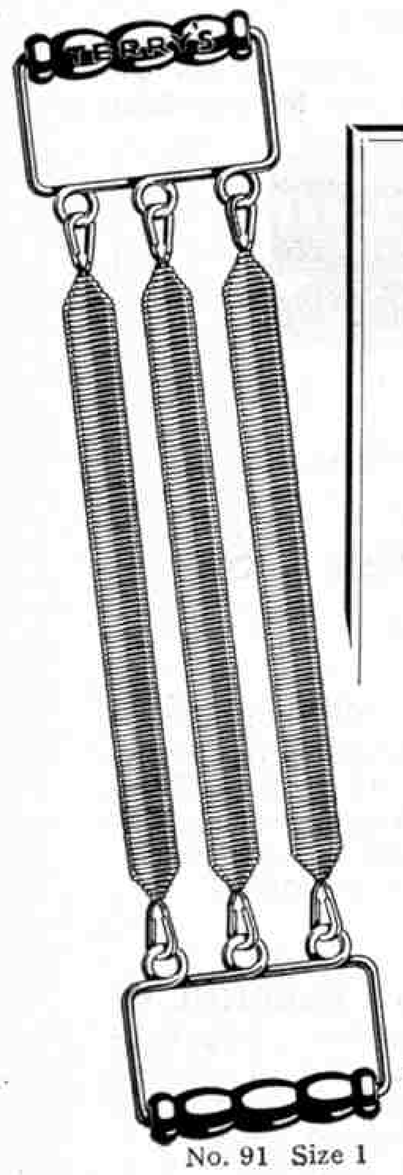

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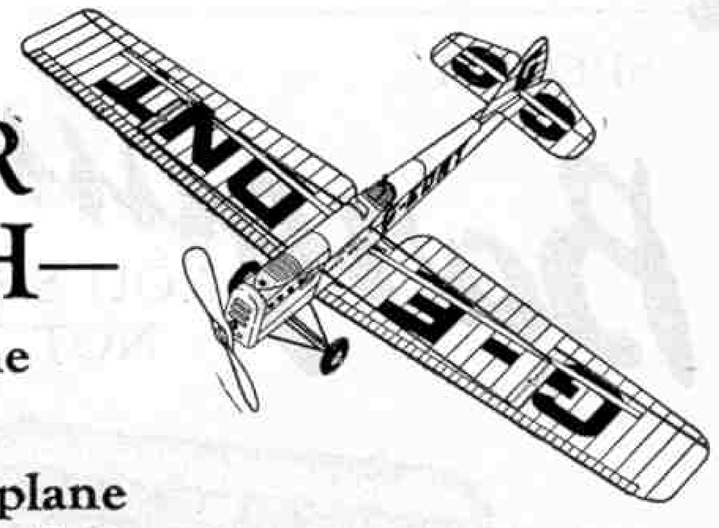

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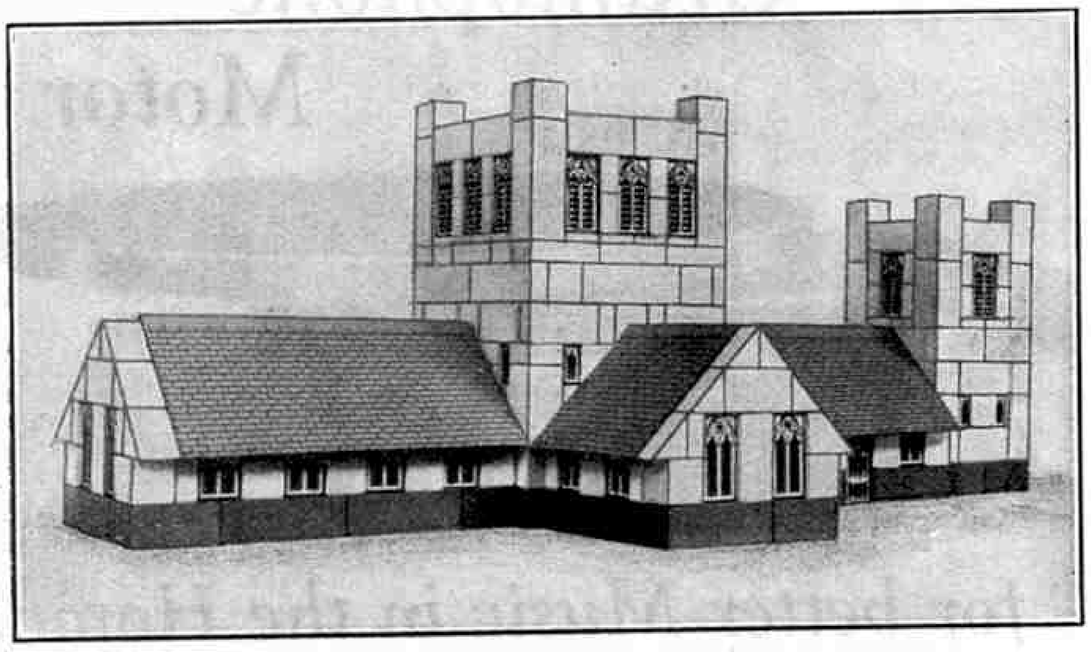

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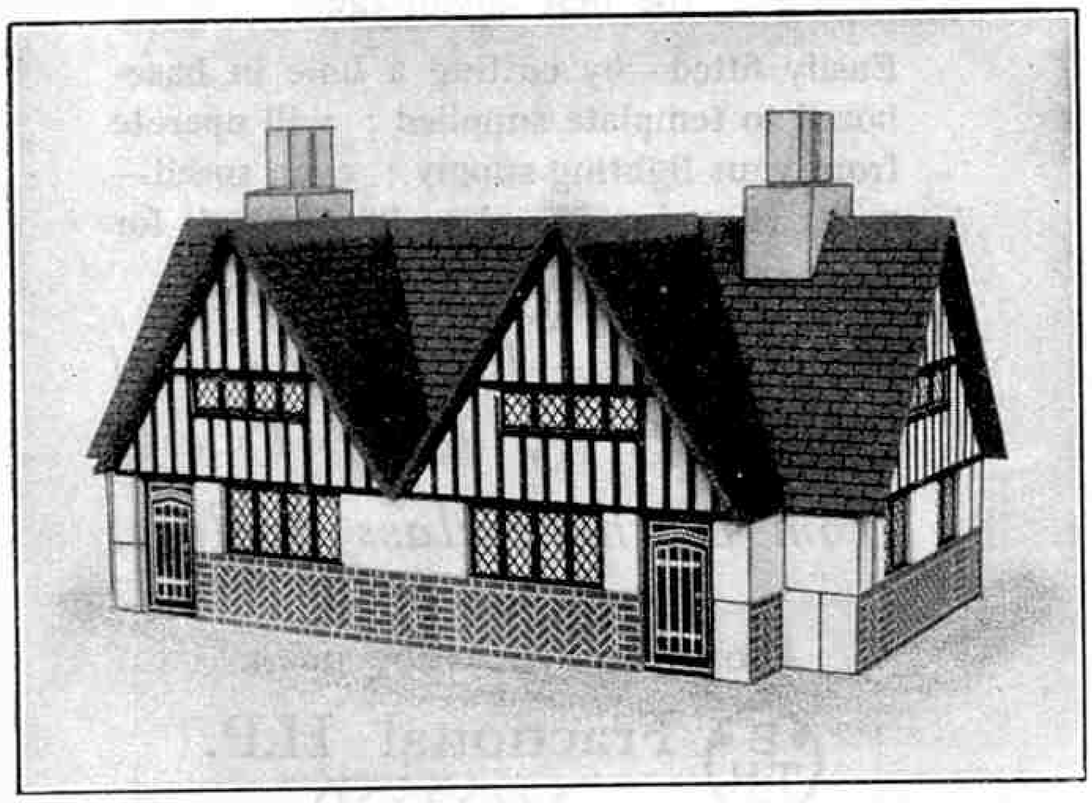

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13/3 DOWN

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7 DAYS' FREE TRIAL.

Carriage paid, and transit risks taken by Riley's.

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Constructed of highest quality materials. Perfect flight guaranteed.

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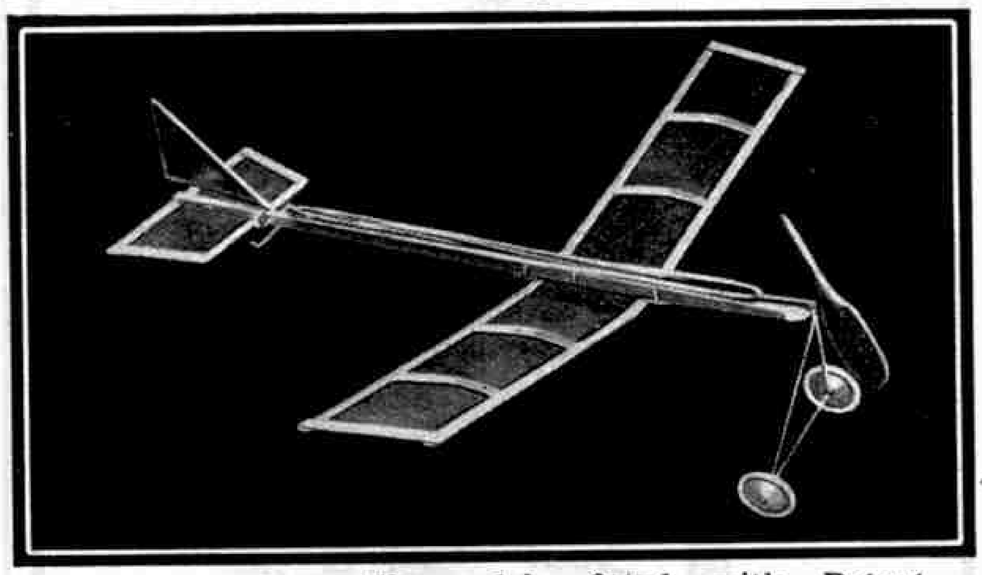

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"SKISAIL" MONOPLANES are obtainable from the leading Stores, Toy and Sports Dealers, including

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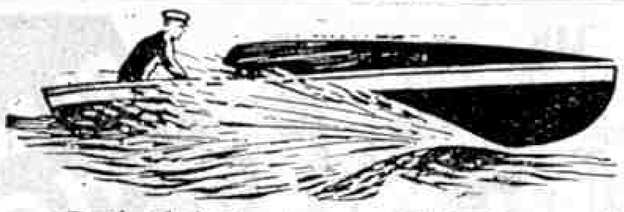

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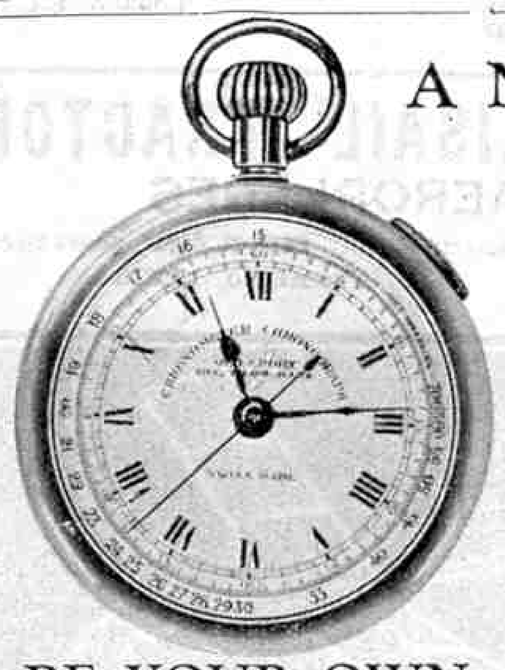

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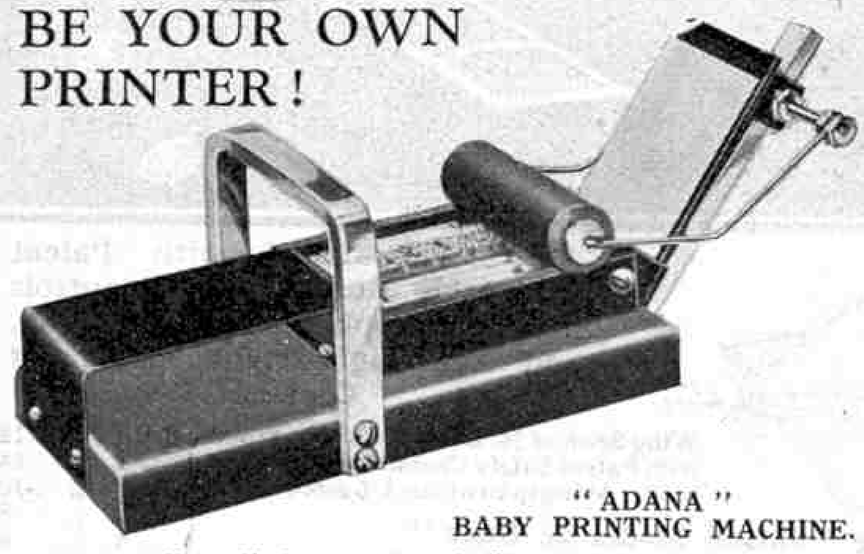

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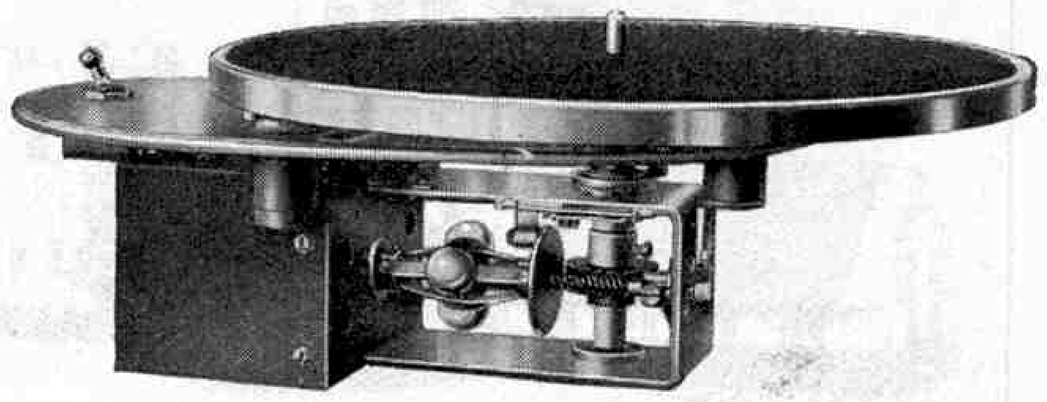

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IT IS MAKING & MENDING DAILY, all over the world

Every house should have a tube of Seccotine.

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Seccotine mends big breakages and small breakages.

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Have your own tubes, and learn what wonders you can do with this famous material. When you have done anything very smart, write to us at the works (address as above).

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THIS rifle fires darts as well as B.B. Shot. It's quite a heavy rifle to handle and is tested for correct sighting before it leaves the factory. Barrel is removable and finished in gun blue.

This, again, is only one of the wide range of DAISY Air Rifles. If this is not quite what you want we may have another that will suit you.

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161

Modern Excavators—*(Continued from page 99)*

superstructure during the transfer of a load from the hoisting motion to the brake, and is of great assistance to the driver. An adjustable seat is provided for the driver, within easy reach of all controls. The engine, winding drum and gearing are enclosed in a corrugated cabin that gives ample protection to the machinery.

The entire superstructure is carried on a wide bedplate that is accurately bored to receive a massive centre pin around which it rotates. This bedplate is supported by four brass-bushed cast steel rollers that follow a circular path on a large cast steel race bolted to the top of the chassis and giving ample stability under all working conditions. In the centre of the race is a boss carrying the steel centre pin.

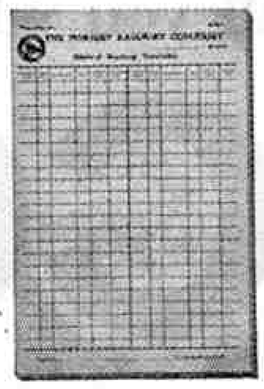
Three jibs of slightly different design are used in connection with the various kinds of work performed by the excavator. The jib that is fitted when the machine is used as a dragline also serves when the machine is converted to a grab excavator. It is supported on a four-part hoist rope attached to the lifting gear at the rear of the machine. A jib of greater strength is employed when the machine is operated as a navvy. It is connected to the revolving frame by large cast jib feet, and is supported on a four-part jib hoist rope attached to one of the main clutch operating drums. Racking motion is obtained by lifting and lowering the jib.

The jib attached when the excavator is required to work as a skimmer scoop is used also for the trench shovel. As stated earlier in the article, the skimmer scoop is used to effect shallow excavations such as are required in the making of roads. The trench shovel, as its name indicates, is used to excavate a deep trench, and this machine has been employed on many important contracts in connection with the laying of long distance pipe-lines. The skimmer scoop is converted to a trench shovel by removing the scoop, turning over the jib, and attaching the arm of the trench shovel to the head of the jib. The jib of the skimmer scoop or the trench shovel is of ample strength to withstand heavy digging loads, and the top end is fitted with triangular plates that carry the drag rope sheave and the jib hoisting sheave. A mild steel guard fitted round the jib head protects the drag rope and sheave if they come in contact with the material. The scoop is fitted with a mild steel cutting lip to which the usual teeth are bolted, and is attached to a steel runner that moves forward upon eight rollers.

In addition to its many land uses, the "Universal" excavator can be easily converted into a floating grab dredger by removing the undercarriage and the caterpillar track and bolting the superstructure to the deck of a suitable pontoon or barge. In this form the excavator has performed useful work in deepening waterways that are too wide for an ordinary dragline to operate successfully. As a grab dredger the machine makes two complete operations per minute, and can dredge 60 tons of gravel per hour.

Mechanical excavators have been employed on many great engineering works, including the Panama Canal and, more recently, the River Shannon Hydro-Electric scheme in the Irish Free State. Powerful electrically-operated excavators have been employed on the recently completed Welland Canal scheme, and huge dragline excavators are at work on extensive irrigation schemes in India.

Hornby Railway Company Forms



Perfect miniature reproductions of the forms used in actual Railway practice are available to members of the Hornby Railway Company.

Pads of the following, each containing 50 forms, may be obtained from Headquarters, price 5d. each, post free. Each type of pad is supplied in a distinctive tint.

G.W.1. General Working Timetables.
S.D.4. Stationmaster's Arrivals and Departures.
E.J.5. Engineman's Job Cards.
S.B.6. Signal Box Instructions.
S.R.7. Stationmaster's Report Forms.

The price of the complete set of five pads is 1/9 post free.

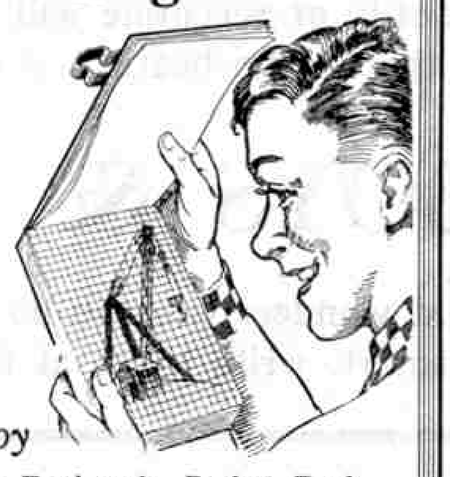
IMPORTANT.

Please quote membership number when ordering supplies.

Headquarters : Hornby Railway Company, Old Swan, Liverpool.

The Meccano Engineer's Pocket Book

Essential to the equipment of every Meccano Boy



The Meccano Engineer's Pocket Book, which has been specially designed for the use of Meccano boys, is strongly bound in imitation red leather, the paper being squared exactly as that used by real engineers. It enables you to make drawings of any engineering structures—Cranes, Bridges, Steam Shovels or Locomotives—that you may see on your travels.

If you are a Meccano boy you should adopt the habit of taking engineering notes and sketches of interest, as this will help you to get a great deal more fun out of your hobby. For instance, supposing you are on a tour of inspection of some interesting docks and a cleverly designed crane catches your eye. "Just the very thing for me to build with my Meccano" you say to yourself, and you immediately proceed to make a sketch of the important features, with a view to constructing a Meccano model of the crane when you get home.

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	00	4d.	4d.
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„	1	1/-	6d.
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„	3	1/8	9d.
„	4	2/11	1/-
„	5	7/9	1/-
„	6	10/10	1/3
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„	0A	8d.	3d.
„	1A	8d.	4d.
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„	5A	2/5	9d.

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„	6A	52/6	*
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Meccano enamel has been introduced to enable model-builders to convert nickel parts to colour or to touch up coloured parts should such treatment become necessary through mishandling. It is available in red, grey or green, each colour being identical in shade with the enamels used in the Meccano Factory for spraying Meccano parts.

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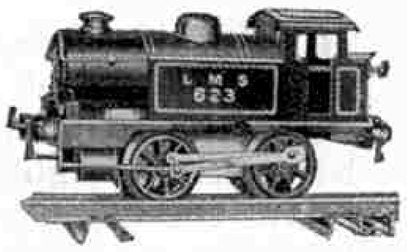
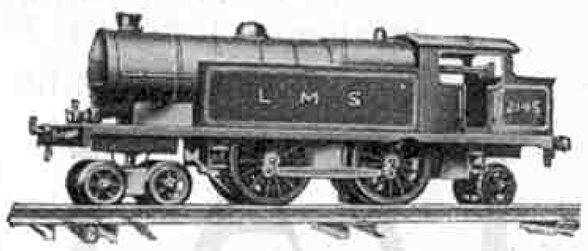
HORNBY TANK LOCOMOTIVES



Hornby No. 1 Tank Locomotive

This is a strong and durable Locomotive, capable of any amount of hard work. It is richly enamelled, highly finished, and is fitted with brake mechanism and reversing gear. Supplied in colours to represent L.M.S.R., L.N.E.R., S.R., or G.W.R. Locomotives. Gauge 0. Price **12/6**



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This Locomotive is fitted with a very powerfu Clockwork mechanism, giving great length of run and exceptional pulling power. It is a perfect model in every respect and is beautifully finished in the colours of the L.M.S.R., L.N.E.R., G.W.R. and S.R. Gauge 0. Price **25/-**

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DARTS, **6d.** doz., **4/6** grs.
BLANK CARTRIDGES, 50, **9d.** ; 100, **1/3.**
Postage on **each** 6d. extra.

H. H. Parsons (Pistol Dept.), **55, Northcote Rd., S.W.11.**

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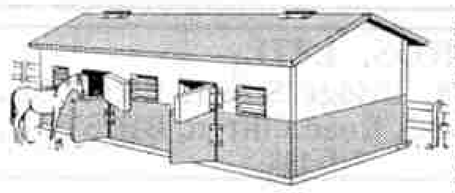

There is much greater fun in model railway working when realistic buildings line the track.

IT IS EASY TO BUILD YOUR OWN with our materials and instruction drawings. The only tools required are a fret saw, a hammer, a screwdriver and a tube of Seccotine.

FARM BUILDINGS SET—soft wood, planed and cut to size, hinges, etc., to build **6-stall stable, pig-sty, cart shed and sheep shed.** Post free **3/9**

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FILMS of every description from 5/-.—Baers, 176, Wardour Street, W.1. Est. 1907. We buy, sell, and exchange.

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EDINBURGH AGENTS for MECCANO and Hornby Trains

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BOYS MAKE YOUR OWN LEAD SOLDIERS

Cowboys, Indians, Animals, Zulus, Model Farmyard Sets, Rodeo, etc. Our CASTING MOULDS make thousands from any scrap lead WITHOUT PREVIOUS EXPERIENCE. Send stamp to-day for Illustrated Catalogue. Complete mould ready for work **2/6.—"TOYMOULDS," 67, Stafford Street, Birmingham.**
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FILMS AND ACCESSORIES. Projectors at all prices from 5/- to £16. Film Spools, Rewinders, Lighting Sets, Screens, Sprockets, etc. Films all lengths and subjects. Sample Film 1/- and 2/6, post free.
Illustrated List Free.
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Patents for Inventions, Trade Marks : Advice Handbooks and Cons. free.—B. T. King, Regd. Patent Agent, 146a, Qn. Victoria St., London, E.C.4. **43 years' refs.**

Meccano & Hornby Train Supplies

All the dealers whose advertisements appear on this and the opposite page carry full stocks of Meccano Outfits, Accessory Outfits, and Meccano parts, Hornby Trains and Hornby Train Accessories all the year round. The names are arranged in alphabetical order of town.

JOHN N. PIPER,
118, Union Street,
Tel. 2797 ABERDEEN.

R. FIELDEN,
Healey House, London Rd.,
Tel. 242 ALDERLEY EDGE.

HARRY BROWN,
1, Moss Lane,
ALTRINCHAM.

BENNETT WATTS,
10, Silver Street,
Tel. 229 AYLESBURY.

Belfast Co-operative Society Ltd.,
20, York Street,
Tel. 6621 BELFAST.

J. BELL,
10, Lower Garfield St.,
Royal Avenue, BELFAST.

RIDDELS LTD.,
Donegall Place & Fountain St.,
Tel. 4171 BELFAST.

SPORTS DEPOT, (Nr. Albert Memorial)
57, Victoria Street,
Tel. 4554 BELFAST.

THORNTON'S SPORTS DEPT.,
24 & 26, Donegall Place,
Tel. 366 BELFAST.

MERCER'S DOLLS' HOSPITAL,
68, Darwen Street,
BLACKBURN.

BATESON'S SPORTS DEPOT,
Abingdon Street,
Tel. 461 BLACKPOOL.

SELLENS BAZAAR,
54, Waterloo Road,
BLACKPOOL, S.S.

BURGESS' BAZAAR,
Opposite The Pier,
BOGNOR REGIS.

BROWN MUFF & CO. LTD.,
Tel. 2890 BRADFORD.

W. CARTER (Brit. Sports Depot),
15, Bridge Street,
Tel. 1166 BRADFORD.

RUSHWORTHS LIMITED,
Kirkgate,
BRADFORD.

JOHN TAYLOR,
28, Preston Street,
Tel. : Brighton 1357 BRIGHTON.

S. H. ARTHUR,
15 & 16, Narrow Wine Street,
Tel. 511 BRISTOL.

C. E. CONEYBEARE,
470-2, Stapleton Road,
Eastville, BRISTOL.

M. W. DUNSCOMBE LTD.,
5 & 7, St. Augustine's Parade,
BRISTOL.

GYLES BROS. LTD.,
Tel. 2888 24, Bridge Street, BRISTOL.
188, Whiteladies Road, Clifton, BRISTOL.
Tel. 143

SALANSON LTD.,
20, High Street, BRISTOL.
119, Queen Street, CARDIFF.

PANTOYS LTD.,
The Promenade,
Tel. 3561 CHELTENHAM SPA.

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16, Silver Street,
Tel. 320 BURY.

HAROLD HUNT,
38, Spring Gardens,
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PHOTO SUPPLIES LTD.,
18, High Street,
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S. DAVIS,
50, Broad Street, CHESHAM.
3, Station Parade, Croxley Green.

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Tel. 2181 CHESTERFIELD.

R. A. HEYES,
6 & 8, Moor Lane,
CLITHEROE.

KENT BLAXILL & CO. LTD.,
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Tel. 2271 COLCHESTER.

DONALDSON'S CAMERA HOUSE,
Metropole Buildings,
CORK.

R. H. JEPSON, 1, Cross Cheaping,
Tel. 4968 COVENTRY.
1, Queen's Road, NUNEATON.

E. A. ANELAY,
Parkgate,
Tel. 2925 DARLINGTON.

HENRY WHALLEY,
195, Duckworth Street,
7, Bolton Road, DARWEN.

RANBY'S LTD.,
Victoria St. & Green Lane,
Tel. 298 DERBY.

C. E. MELLER,
55, Hall Gate,
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SHEARD, BINNINGTON & CO.,
44, High Street,
Tel. 85 DONCASTER.

JAMES L. DIXON,
14, Suffolk Street,
Tel.: Dublin 21826 (off Grafton St.), DUBLIN.

A. CURRIE,
The Emporium, 92, High Str.,
Tel. 82 DUMBARTON.

DIXON'S,
41, High Street,
Tel. 5810 DUNDEE.

MARTINS',
232, Hilltown,
DUNDEE.

SMITH BROTHERS,
"The Globe," 3-15, Murraygate,
DUNDEE.

ALDERTON'S,
8, Bank Parade,
Tel. 0303 EDGWARE.

ANDERSONS,
105, Princes Street,
EDINBURGH.

FLEMING'S STORES LTD.,
2 & 4, Earl Grey Street,
Tel. 30118/9 EDINBURGH.

HOWARDS LTD., 31, Church Str., & 72, Chase Side, ENFIELD, also 246, Lordship Lane, WOOD GREEN.

Devon & Somerset Stores Ltd., Toy & Sports Dealers, Tel. 2638 Telegrams : Stores, Exeter EXETER.

NEWMAN & SON, Cash Stores, Tel. 58 FAKENHAM, Norfolk.

ROBERT BALLANTINE, 103½, St. Vincent Street, Tel. : Central 5619 GLASGOW.

BOW'S EMPORIUM Ltd., High Street, Tel. : Bell 885 GLASGOW, C.1.

Established 1789. CLYDE MODEL DOCKYARD, 22-23, Argyll Arcade, GLASGOW. Model Makers to the Admiralty, Railway Coys., etc.

DUNCAN BELL & CO., 320, Byres Road, Tel. West 3807 GLASGOW.

LUMLEY'S, Lumley House, Sauchiehall Street, Tel. : Douglas 2701 GLASGOW.

PETTIGREW & STEPHENS LTD., Sauchiehall Street, GLASGOW.

R. WYLIE HILL & CO. LTD., 20, Buchanan St. & Argyll Arcade, GLASGOW, C.1.

G. WATSON, Guildford Doll's Hospital, Swan Lane, GUILDFORD.

H. J. PIGGOTT LTD., 37, West Street, Tel. 32 HORSHAM.

H. POULTON, Toyland, 75 & 77, High Street, HOUNSLOW, Middlesex.

GAMLEYS LTD., Branches opp. Town Hall, Hove & Eastbourne Stn., also at Haywards Heath.

YE OLDE TOY SHOPPE, Chariot Street, Tel. : Central 1031 HULL.

WALKER'S EMPORIUM, 25-29, Inglis Street, INVERNESS.

W. S. COWELL LTD., Butter Market, IPSWICH.

TOWNLEY & TAYLOR, Tel. 570 KENDAL.

PEARSON & DENHAM (PHOTO) LTD., 6, Bond Street, LEEDS.

SADLER'S, Toy Dept., 201, (Top) Woodhouse Lane, Tel. 22236 LEEDS.

Leicester Co-operative Society Ltd., High Street, LEICESTER.

ROBOTHAM'S LIMITED, "Baby's Kingdom," Tel. 4809 Belvoir St., LEICESTER.

Thomas Armstrong & Brother Ltd. 33, Dale Street, Tel. : Central 3301 LIVERPOOL.

FRISBY DYKE & CO. LTD., 56/66, Lord Street, Tel. : Bank 610 LIVERPOOL.

PHILIP SON & NEPHEW LTD., 20, Church Street, Tel. 4134 Royal LIVERPOOL.

GEORGE STURLA & SON LTD., 209, Walton Rd., 155, Park Rd., Tel. : Central 3929 & Royal 5074 Liverpool.

E. PICTON, 82, Stepney Street, LLANELLY.

ACACIA STORES LTD., Upper Tooting Road, LONDON, S.W.17.

"BABYLAND," 34, High Rd., Lee, S.E.13. 60, Well Hall Rd., Eltham, S.E.9.

FREDERICK BECK, 22, 24 & 26, Camden Passage, Tel. : Clerkenwell 8403 LONDON, N.1.

A. & B. BLACKMAN & SONS, 11a-17, Fortess Road, Kentish Town, Tel. Mount View 4310 LONDON, N.W.5.

Bon Marché Ltd., Brixton, LONDON, S.W.9.

DEMPSEY & CO., 69, South Side, Clapham Cm., LONDON, S.W.4.

OGDEN SMITHS LONDON DEPOTS, Clapham Junction, Sutton, Bromley, Croydon, Twickenham, Brixton and Sydenham. Chief Office, Clapham Junction.

W. HUMPHRYS & SON, 269/271/273 & 275, Rye Lane, Estab. in 1840 PECKHAM, S.E.15.

LAFFEATY, 308, King's Road, Chelsea, Tel. : Kensington 2705 LONDON, S.W.3.

LEDWITH BROS., 42 & 44, Walworth Road, Nr. ELEPHANT AND CASTLE LONDON, S.E.17.

PERCIVAL & CO., 140, High Street, Tel. Wstw. 0120 WALTHAMSTOW, E.17.

F. J. WAIN & SON, 478, Kingsland Road, Tel. : Clissold 9269 DALSTON, E.8.

SPALDING SPORT SHOPS, For Branch Addresses see advertisement on page 177.

F. R. POTTER & SON, 43, Market Place, LOUGHBOROUGH.

H. G. PARTRIDGE & CO., 10, Chapel Street, Tel. 234 LUTON.

"GILBERT," 116/118, Week Street, MAIDSTONE.

A. E. WILKINSON & SON, 57, High Street, Tel. 831 MAIDSTONE.

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A. INMAN, MANCHESTER. 105, Lapwing Lane, Didsbury. Tel. 1518. 179, Dickenson Rd., Rusholme. Tel. 2241.

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J. T. SANSOM & CO., 42, West Gate, MANSFIELD.

JACKSON'S CYCLE STORES, 158, Parliament Road, MIDDLESBROUGH.

Meccano & Hornby Train Supplies

All the dealers whose advertisements appear on this and the opposite page carry full stocks of Meccano Outfits, Accessory Outfits, and Meccano parts, Hornby Trains and Hornby Train Accessories all the year round. The names are arranged in alphabetical order of town.

R. SCUPHAM & SONS LTD.,
35, Linthorpe Road,
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E. C. MORRIS,
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Tel. 171 MOTHERWELL.

W. MARK & CO. LTD.,
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Tel. 461 NORTHAMPTON.

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CARTWRIGHT & GAUNT,
231, Mansfield Road,
NOTTINGHAM.

E. O. ELLIS,
195 & 197, Berridge Road,
NOTTINGHAM.

J. R. NORRIS,
Photographic Dealer,
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PEARSON & PEARSON,
12, Angel Row,
NOTTINGHAM.

REDMAYNE & TODD LTD.,
Carrington Street,
Tel. 41604 NOTTINGHAM.

THE ATHLETIC STORES,
Opposite Town Hall,
Tel. 1238 OLDHAM.

E. DE LA MARE,
9/13, George Street,
Tel. 3456 OXFORD.

SMITH & TOLLEY,
London Road, Headington,
Tel. 6843 OXFORD.

C. HORSBURGH,
12, High Street,
PAISLEY.

LAWSONS LTD.,
13, Frankfort Street,
Tel. 398 PLYMOUTH.

D. J. WARREN,
6, Hyde Park Place, Mutley,
Tel. 1482 PLYMOUTH.

ERIC G. ENGLAND,
Tel. 63 PONTEFRACT.

JOHN TAYLOR,
Ropergate,
Tel. 67 PONTEFRACT, Yorks.

COSTELLO'S, Tobacconist & Toy Dealers, 87, Marsh Lane,
PRESTON.

THOMAS JARVIS LTD.,
REDRUTH. Branches at Cambourne, Penzance, Truro, Newquay & Falmouth.

F. SHEPPARD,
58, Kew Road,
Tel. 1970 RICHMOND, SURREY.

GERALD MORRIS,
24 & 26, High Street,
ROCHESTER.

WM. COOPER,
6, Doncaster Gate,
Tel. 13 ROTHERHAM.

JAMES GRAHAM,
9, Montague Street,
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COLE BROS. LTD.,
Children's Floor,
Tel. 21071 Fargate, SHEFFIELD.

SHEFFIELD PHOTO CO. LTD.,
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SOUTHAMPTON.

OSBORN & CO. (So'ton) Ltd.,
9, High Street,
Tel. 3587 SOUTHAMPTON.

RAVEN'S STORE,
90-92, High Street,
Tel. 67665 SOUTHEND-ON-SEA.

The London Cycle & Sports Co. (H. W. Ginn), 106, High Street,
Tel. 252 STAINES.

WRIGHT & CO.,
365 & 367, High Street,
Tel. : Maryland, 2942 STRATFORD, E.15.

DARNBROUGH & SONS LTD.,
59, High Street,
Tel. 66671 STOCKTON-ON-TEES.

DAN MORGAN, The Meccano Centre,
218, Oxford St.,
Tel. 2346 SWANSEA.

GOLDSMITH'S,
18, High Street,
Tel. 392 SWINDON.

FREDK. HARVEY,
4, Wellington Street,
Tel. 75 TEIGNMOUTH.

S. MAKIN,
120/124, Thatto Heath Rd.,
THATTO HEATH.

BATHE'S RADIO & GRAMOPHONE STORES, 19, Abbey Road,
Tel. 2934 TORQUAY.

WEBBERS' SPORTS DEPOT, EXETER. Tel. 3344 13/14, Victoria Parade, TORQUAY. Tel. 2453.

E. M. COLLINS,
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L. MYERSCOUGH, 57, South Rd.,
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51, Church Street,
Tel. 210 WEYBRIDGE.

PATES BROS.,
10, Royal Cres., and
12, Frederick Pl., WEYMOUTH.

GILLITT & CO.,
26b, Lowther Street,
Tel. 318 WHITEHAVEN.

W. SHERWOOD MILLER,
34/7, Central Arcade,
Tel. 779 WOLVERHAMPTON.

W. JACKSON,
56 & 58, High Road,
WOODFORD GREEN.

MECCANO DEALERS PLEASE NOTE

Our charge for this space is £5 for twelve months. It is open to all dealers carrying full stocks of Meccano Goods and Hornby Trains.

How to obtain the "*M.M.*"

The "*M.M.*" may be ordered from all Meccano dealers, or from any newsagent or bookstall, price 6d. per copy. If desired it will be sent direct, post free, for 4/- for six, or 8/- for twelve issues. As a rule back numbers cannot be supplied, because only sufficient copies are printed to fill standing orders. To prevent disappointment, therefore, place a regular order with your dealer, newsagent, or the publishers—

"Meccano Magazine," Binns Road, Old Swan, Liverpool.

MECCANO LUBRICATING OIL

Before commencing to operate a Meccano model, or to run a Hornby Train, all gears and bearings should be oiled thoroughly with Meccano Lubricating Oil. This oil is specially prepared and is of the right consistency for the purpose. Price per bottle 6d.

Meccano Ltd., Binns Road, Old Swan, Liverpool.

MECCANO MANUALS

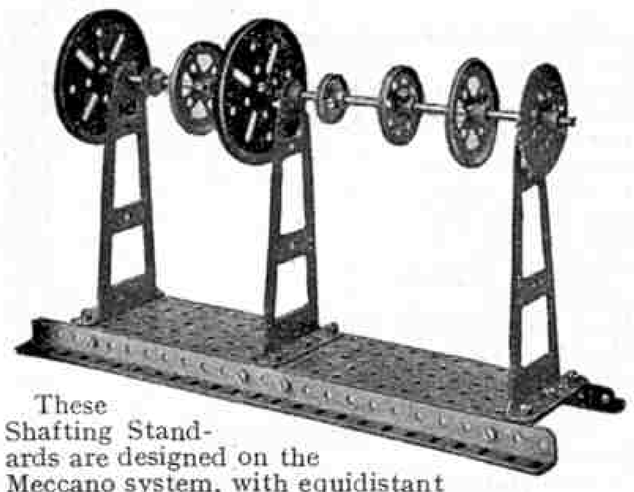
The Meccano Manuals are all beautifully printed and the illustrations are in half-tone throughout. Every Meccano boy should possess a copy of each of the 00-3 and 4-7 Manuals, in which a total number of 846 models is illustrated, and also a copy of the Standard Mechanisms Manual, in which a fine selection of real engineering movements that may be built with Meccano are reproduced. These Manuals may be purchased as separate units, or attractively bound in full cloth cover, lettered in gold.

The prices of the full range of Meccano Manuals are as follows :—

No. 0 Manual of Instructions	Price	6d.
No. 00-3 „ „	„	1/6
No. 4-7 „ „	„	1/6
Standard Mechanisms Manual	„	1/-
How to use Meccano Parts	„	6d.
Bound Manual of Instructions ...	„	7/6

Meccano Ltd., Binns Road, Old Swan, Liverpool.

MECCANO SHAFTING STANDARDS

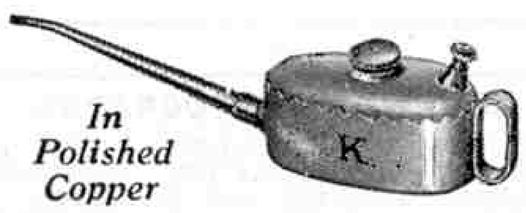


These Shafting Standards are designed on the Meccano system, with equidistant holes. Our illustration shows how strong and serviceable shafting may be constructed from Meccano parts with the aid of the Large Standard.

Standard only, Large... ... ... Price 1/-
„ „ Small ... ... „ 8d.

Meccano Ltd., Binns Road, Old Swan, Liverpool.

OIL CAN No. 2 ("K" Type)



In Polished Copper

Every Meccano and Hornby Train enthusiast should add a miniature "K" type oil can to his equipment for the purpose of oiling Meccano models, Hornby Trains, etc. The oil is ejected drop by drop by depressing the valve, as in the full-sized model, and in all other respects the oiler is perfect.

One of the oil cans was sent to H.R.H. the Prince of Wales, and a gracious letter of acknowledgment was received expressing H.R.H.'s admiration of the beautiful lines and perfect finish of this model. Price 3/6.

Meccano Ltd., Binns Road, Old Swan, Liverpool.

"MECCANO MAGAZINE" BINDERS

There is no better way of keeping your Magazines clean and tidy than by binding them in one of the special binders we supply.

These binders have strong stiff backs, covered with black imitation leather, tastefully tooled, and are lettered in gold. The large binder holds 12 Magazines—price 4/6 post free. The small binder holds 6 Magazines—price 3/- post free. Meccano Ltd., Old Swan, Liverpool.

OIL CAN No. 1 (Ordinary Type)

This miniature Oil Can will give every satisfaction. It may be used for general purposes but it is particularly suitable for oiling Meccano Models and Hornby Trains. Price 6d.

Meccano Ltd., Binns Road, Old Swan, Liverpool.

COMPLETE YOUR FILES

All "Meccano Magazines" prior to December, 1923, are out of print. Each of the 1924 issues, with the exception of January, February, March and September, is in stock. Only the June, October and November, 1925, issues are available. All the 1926 to 1930 issues are in stock, with the exception of January, February, April and May, 1926, January, March, July, August and September, 1927, January and February, 1928, and January, 1930.

Copies of back issues will be sent, post free, price 3d. for issues prior to 1925, 4d. for the issues of 1925 and 1926, with the exception of the December numbers. The December issues of 1925 and 1926, and all the issues of 1927, 1928, 1929 and 1930 are 8d. each.

Quotations for complete bound volumes may be obtained from the publishers—

"Meccano Magazine," Binns Road, Old Swan, Liverpool.

Binding the "M.M."

There are two methods of binding the "*M.M.*" to preserve back copies from the mutilation that inevitably will be theirs should they be handled for any lengthy period without protection. First there is the spring-back binder system, that permits the copies to be inserted or removed from the binding case at will. This is intended primarily as a temporary arrangement for the protection of copies during the currency of their volume.

Handsome spring-back cases specially prepared for the "*M.M.*," with the name blocked in gold letters on the front cover, can be obtained from Meccano Limited, Binns Road, Old Swan, Liverpool, price 3/- and 4/6 for sizes large enough to hold 6 and 12 copies of current issues respectively.

Permanent binding cases for back numbers of the Magazine can be supplied by Messrs. O. H. Bateman and Co., 23, Hanover Street, Liverpool. These cases are supplied in two sizes (1) for six copies, price 3/6 and (2) for twelve copies, price 5/3 post free in each case. The binding cases are supplied in what is known as "Quarter Basil, full cloth"—that is to say three-quarters of the sides are dark crimson cloth and the back and a quarter of the sides are dark crimson leather as shown above. The case is tastefully embossed in gold with the name "Meccano Magazine," and on the back is the name and volume number.

Binding Six or Twelve Copies

These binding cases are supplied so that readers may have their Magazines bound locally, but where desired, the firm mentioned above will bind Meccano Magazines at a charge of 6/6 for six issues or 8/6 for twelve issues, including the cost of the binding and also return carriage. The covers of the Magazines may be included or omitted as required, but in the absence of any instructions to the contrary they will be included.

Whilst the binding of the twelve Magazines is quite satisfactory, they form a rather bulky volume and for that reason arrangements have been made to bind six months' Magazines where so desired, as explained above. Back numbers for any volume can be bound and the case will be embossed with the volume number.

Readers desiring to have their Magazines bound need only make a strong parcel of them, include a note of their name and address together with the necessary remittance, and send the parcel direct to Messrs. O. H. Bateman and Co., carriage paid.

READERS' SALES

Wanted. Old Schoolboy's Own Library books below number "99," also Holiday Annuals, 1928 & 1929. State price.—Statham, 42, Barn Lane, King's Heath, Birmingham.

Sale. Air Pistol, cost 13/6. Would take 7/6.—Jenkins, "The Cottage," Cobden Avenue, Bitterne Park, Southampton.

For Sale. Pathé Baby-Ciné Projector, [illegible] used twice. Complete with lamp, resistance and one film. Cost £6/0/0. Price £4/10/0.—T. Williams, 12, Maesyrhaf Road, Llanerch Llanelly.

Amazing Bargain! For Sale, Adana Octavo Treadle Printing Machine and accessories. Just purchased. £6 or near offer. Apply—36, Bromley Road, London, S.E.6.

Sale. Spare Canadian Stamps. Send for List to—G. Kennedy, Cornermead, Newbury, Berks.

Wanted. Pathéscope films for "Kid" Projector, cheap and in good condition.—State, 13, Priory Road, Edgbaston.

Sale. Approx. 340 Brand New Railway Photographs in Album, cost 3d. each. Bargain, 45/- post free, also Ukelele Banjo 15/6.—Bonham, 51, Nechells Park Road, Nechells, Birmingham.

Bowman Loco, 27/6, Steam. Highest Offer.—S. Luckin, Meath Green, Horley, Surrey.

12/6 Bowman Steam Engine, practically new, sell for 8/- carriage paid.—L. White, 104, Furnham Road, Chard.

Sale. "M.M's" Feb. 1926-April 1930, 10/- carriage forward.—Fayers, 52, Shaftesbury Road, London, N.19.

For Sale. 4 Volumes, Britain Beautiful. Cost £4/4/-. 2 Volumes, Marvels of the Universe. Cost £2/2/-. 1 Volume, Wonderful Britain. Cost 18/6. 1 Volume, Wonderful London. Cost 18/6. All perfect. What offers? Enquiries welcomed.—E. H. Wilson, Bank Buildings, Green Lane, Northwood, Middlesex.

Sale. Bowman Steam Engine. Condition new. Cost 32/6. Also Baby 'Cello. Offers?—Fletcher, 366, Oakworth Road, Keighley.

Sale. Gauge 0—Engines, Coaches, etc. List.—Rebbeck, Sandown House, Knock, Belfast.

Meccano Guild Member wishes to correspond with other Meccano Boys.—BM/NLEG, London, W.C.1.

Sale. Stamps and Album; catalogued £4. Sell 27/6. 1930 Catalogue Free to Purchaser. Cost 7/6. 30/- Chemistry Cabinet. Sell 12/6.—Wood, 24, Wellhouse, Golcar, Huddersfield.

Bassett-Lowke "Duke of York" Electric Engine and Tender, 4-8 volts, 16/6. Cost 36/-.—J. Mitchell, "Sunnyside," Woodlands Park, Timperley, Ches.

Sale. Station, Tunnel, Signal Box, Small Train and Lines, and 000 Train Accessories, 20/- or next best offer.—A. Barrow, High Bank, Grafton, Hereford.

"Meccano Magazines," 1926-30. 110 "Scouts." All clean. Offers, together or separately.—King, "Newsetts," Tring.

Sale. Bowman Loco and Tender. Good condition. What offers?—Dell, Abinger, Dorking.

B.D.V. and other Cigarette Coupons wanted. State particulars and price. For Sale "Veeder" Cyclometer (Trip Model). Offers?—Box 201.

Sale. Collection, 2,000 different Stamps of the World, 35/-. 500 Stamps, British Empire, 25/-. 500 Stamps, French Colonials, 30/-. List, Stamp.—Kilpatrick, Thirlestone, Helensburgh.

Sale. Cinematograph, new, standard size, fitted main's electric light, few Films. £2.—208, Algemon Road, Lewisham, S.E.

Cigarette Cards. Sets. Odds. Lots. Lists.—Thornton, 159, Grosvenor Road, Wavertree, Liverpool.

CIGARETTE CARDS SPECIAL NEW YEAR OFFER

5 sets (200 cards) with Slip-in Album to hold 200 cards, **2/9** post free. New list of nearly 300 sets free.
THE BRITISH CIGARETTE CARD CO.,
47, Lionel Road, Brentford, Middlesex.

CINEMATOGRAPHS British Made from 37/6
CINEMATOGRAPH FILMS
from 5/- per 1,000 ft.
Write for our Catalogue, post free, or send 1/- for sample length of Film and Catalogue.
Filmeries Co., 57, Lancaster Rd., Leytonstone, E.11

Cinematographs, Standard Films, Cheap. Join our Film Library. Lists—"Cinema," 109, Kenlor, Tooting.

A MODEL THAT FLIES

Correct aerodynamic principles are applied in the construction of the NEW TRACTOR MONOPLANE and the high-quality materials used make this model almost indestructible. A patent safety device prevents propeller and wing from striking the ground on landing. Has a remarkable performance (including 250 yards flight) and can be stunted.
Price **4/6**, Postage 6d.
L-V MODELS, Astor House, Aldwych, London, W.C.2.

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RAILWAY PHOTOGRAPHS.

We have just added a complete set (ten) of the "Schools" class to our list. Send 4d. for Specimen Photograph and list **M.10.** All Photographs postcard size, 3d. each, 2/6 doz.
Railway Photographs, 23, Hanover St., Liverpool.

MECCANO ENAMEL

Meccano enamel has been introduced to enable model-builders to convert nickel parts to colour or to touch up coloured parts should such treatment become necessary through mishandling. It is available in red, grey or green, each colour being identical in shade with the enamels used in the Meccano Factory for spraying Meccano parts.
Price per tin 8d.
Meccano Ltd., Binns Road, Old Swan, Liverpool.

H.R.C.

WRITING PADS

Every member of the Hornby Railway Company should make a point of using the special H.R.C. writing paper for correspondence with his friends and with Headquarters. It is available in two sizes and is supplied in pads, each consisting of 50 sheets of superfine buff paper, and cover.

Prices, Large Size 1/- each (post free). Small Size 6d. each (post free).

ENVELOPES

Special envelopes, attractively printed and matching the writing paper in colour, are also available. These are suitable for both the large and the small sheets of writing paper.

Price, per packet of 50, 8d. post free.

Small Size Price 6d. (Post free)

Large Size Price 1/- (Post free)

Meccano Ltd., Old Swan, Liverpool.

MECCANO MAGAZINE

Registered at G.P.O., London, for transmission by Canadian Magazine Post.

EDITORIAL AND ADVERTISING OFFICE:—
OLD SWAN, LIVERPOOL, ENGLAND.
Telegrams: "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/- for six issues and 8/- for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

Readers' Sales and Wants. Private advertisements (i.e., not trade) are charged 1d. per word, minimum 1/-. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

Advertisers are asked to note that private advertisements of goods manufactured by Meccano Limited cannot be accepted.

Small Advertisements. 1/6 per line (average seven words to the line), or 16/- per inch (average 12 lines to the inch). Cash with order.

Display. Quotations for space bookings, and latest net sale figures, will be sent on request.

Press Day, etc. Copy should be sent as early in the month as possible for insertion in following issue. We usually close for press on or before 6th of each month for following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 8d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

Ordering the "M.M." Overseas

Readers Overseas and in foreign countries may order the "*Meccano Magazine*" from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/5 per copy (postage extra), and the subscription rates 9/6 for six months and 19/- for 12 months (post free); Canada, where the price is 15c. per copy, and the subscription rates 75c. for six months, and $1.50 for 12 months (post paid).

The U.S.A. price is 15c. per copy, and the subscription rates $1 and $2 for 6 and 12 months respectively (post free).

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the home market. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

CANADA: Meccano Ltd., 34, St. Patrick St., Toronto.
UNITED STATES: Meccano Co. of America Inc., New Haven, Conn. Meccano Co. of America Inc., 200, Fifth Av., New York.
AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.
NEW ZEALAND: Models Ltd., Kingston & Federal Streets, Auckland.
SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.
INDIA: Karachi: Bombay Sports Depot, Elphinstone Street, Bombay; Bombay Sports Depot, Dhobi Talao. Calcutta: Bombay Sports Depot, 13/C, Old Court House Street.

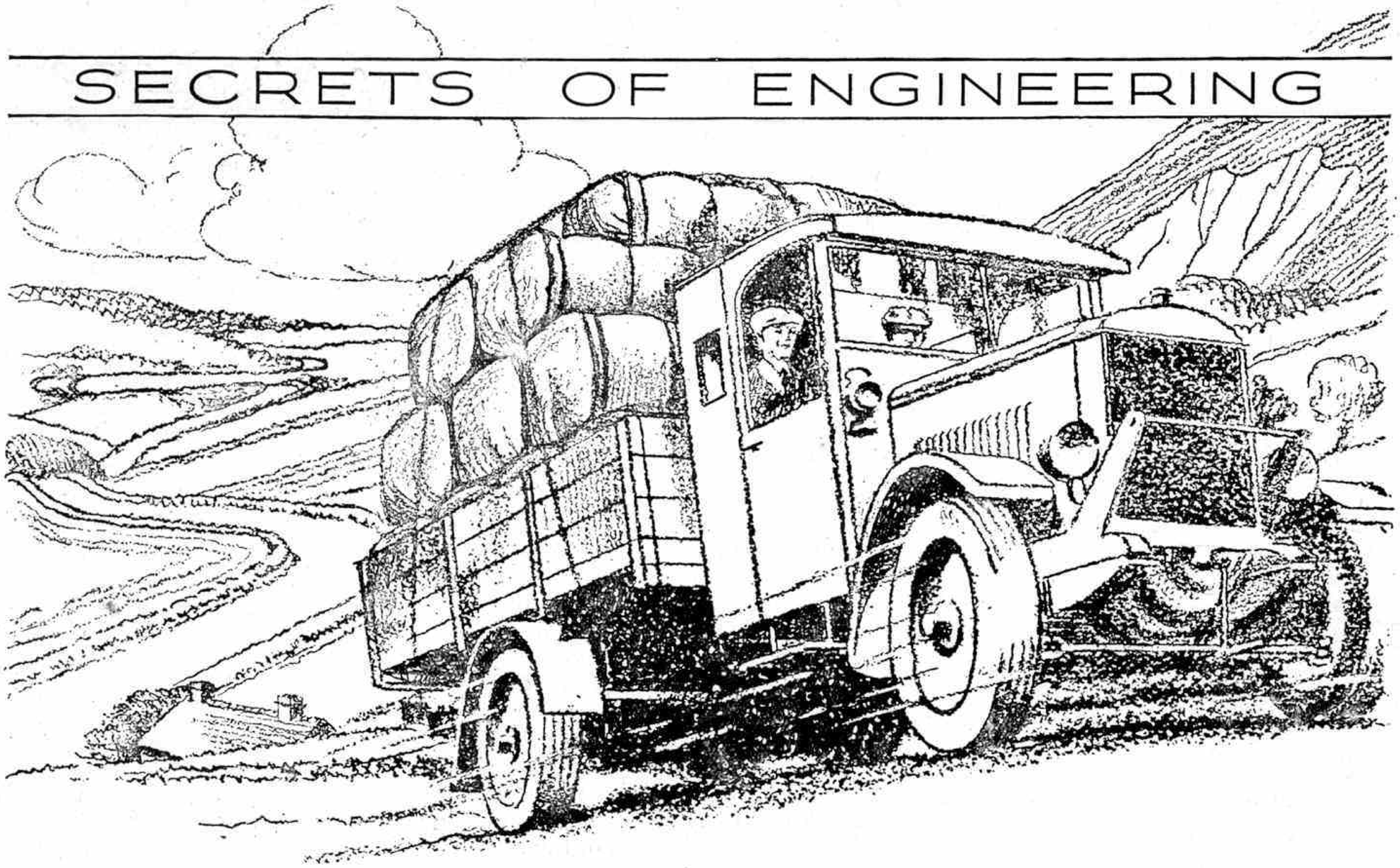
The Editor wishes to make known the fact that it is not necessary for any reader to pay more than the published price. Anyone who is being overcharged should lodge a complaint with the Meccano agent in his country or write direct to the Editor.

Mystery Photograph No. 26

The number of correct entries in the January Mystery Photograph Competition was larger than in any previous contest, the sharp eyes of my readers apparently having little difficulty in recognising the point of a twist drill. There were few incorrect entries, the most remarkable of the wrong suggestions being "the worm of a mincing machine," "the shutter leaves of a camera"—and "an apple cut in four pieces!"

The first correct entry was received from D. Manser, Nettlestead, nr. Maidstone, to whom an autographed copy of my book "Engineering for Boys" has been sent.

SECRETS OF ENGINEERING

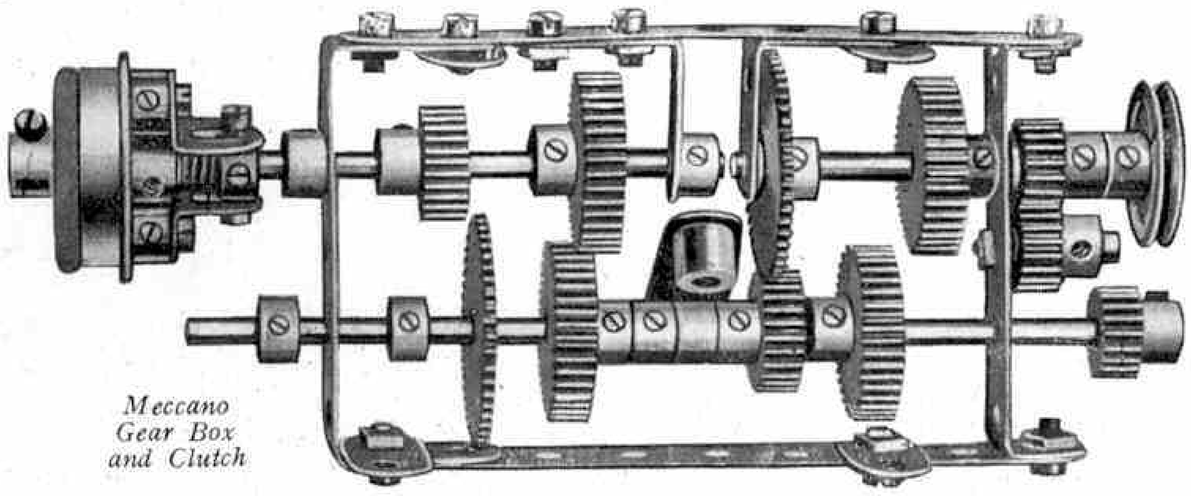


Why do motor cars have gears?

The power of a steam engine is increased by merely admitting more steam to the cylinders, and the full pressure of the steam is exerted at all engine speeds. An internal combustion engine, on the other hand, only develops its full power when it is run at high speed. When a motor car begins to climb a hill, the speed of the engine decreases as more power is demanded from it. The engine cannot provide this power unless its speed is maintained, and this is done by means of gears. The movement of a lever brings into play a new train of gear wheels between the engine and the back axle, and this has the effect of increasing the speed of the engine relative to that of the road wheels.

Mysteries hidden in the gear box!

The operation of the gears that are hidden away in the gear box of a motor vehicle is only one of the many interesting engineering secrets that may be learned by means of Meccano, which includes all the gear wheels necessary to reproduce practically every type of gear that is used in real engineering. A splendid example of the wonderful possibilities of Meccano is the gear box of the Meccano Motor Chassis illustrated here, in which are incorporated all the features of a real gear box. This model is so perfect in design and operation that it is used for demonstration purposes in many Schools of Motoring. Full particulars for building the complete Meccano Motor Chassis Model are contained in a special leaflet, obtainable from any Meccano dealer, price 3d., or direct from Meccano Ltd., Old Swan, Liverpool, price 3d., post free.



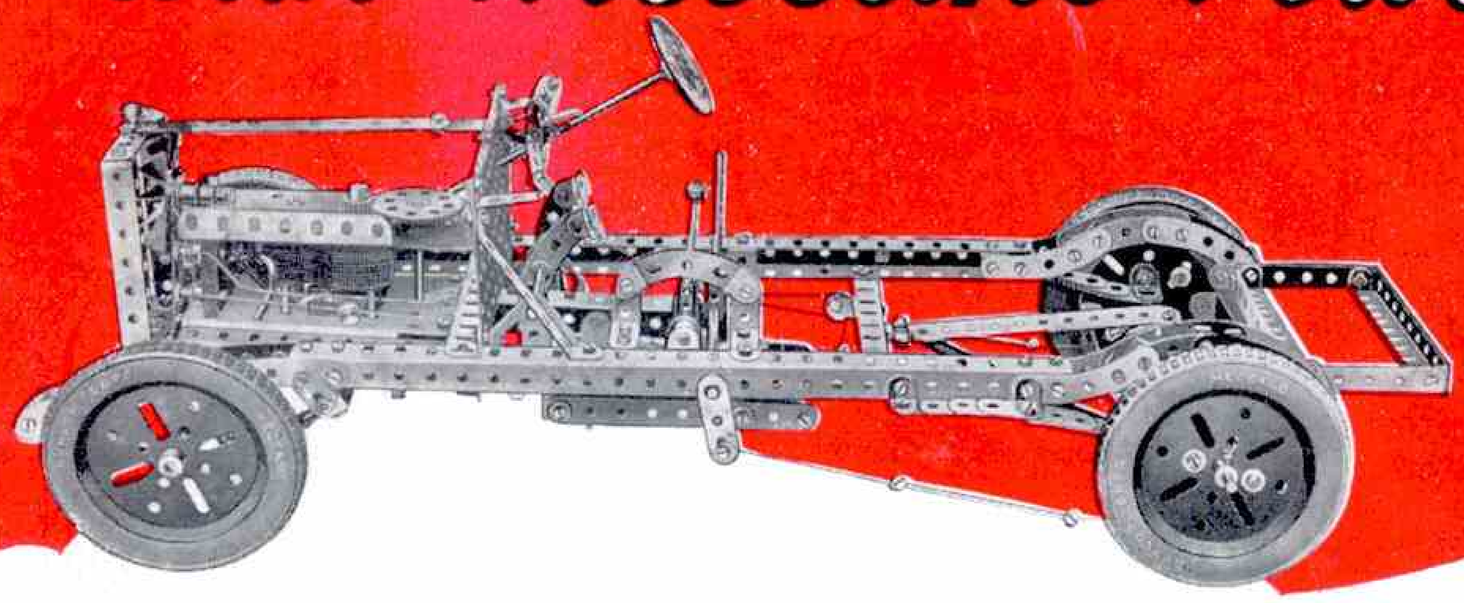
Meccano Gear Box and Clutch

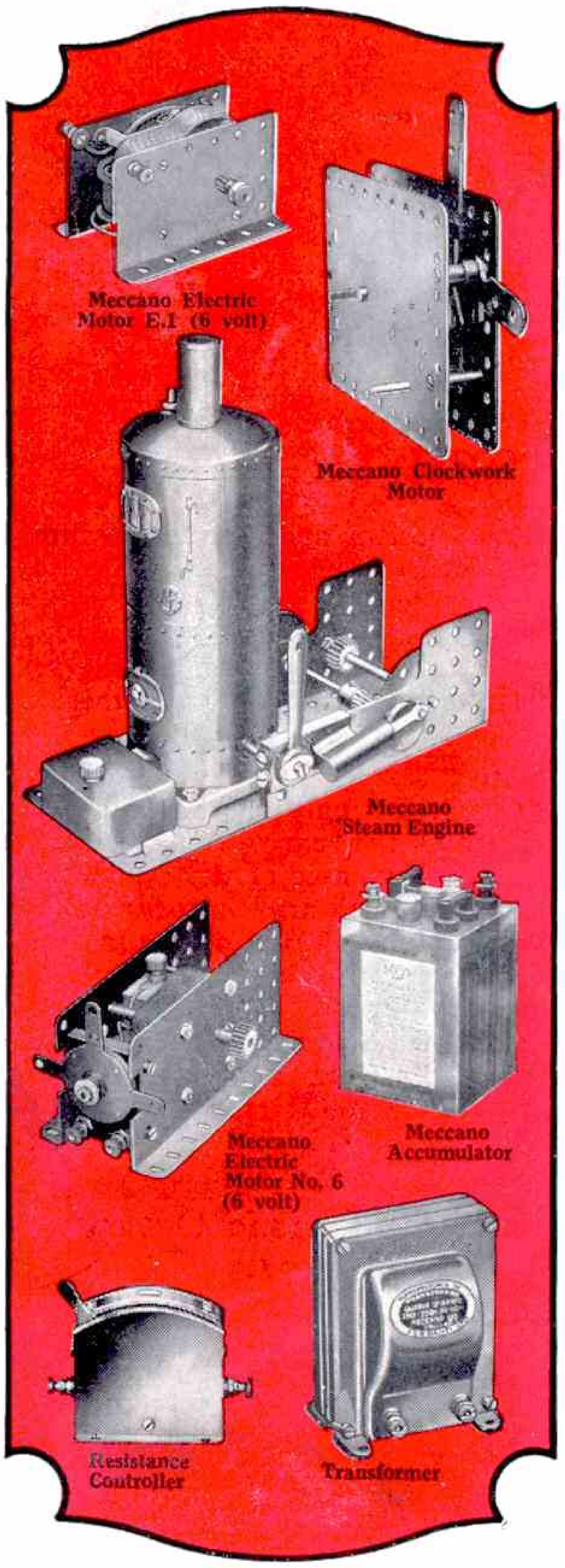
Prices of complete Meccano Outfits from 2/- to 450/-

MECCANO

MECCANO LIMITED — OLD SWAN — LIVERPOOL

I run my models with Meccano Power





If you want to obtain the fullest possible enjoyment from the Meccano hobby you should operate your models with a Meccano Motor or Steam Engine. You push over the control lever of the motor or engine and immediately your Crane, Motor Car, Ship Coaler or Windmill commences to work in exactly the same manner as its "big brother" in real life. Could anything be more exciting?

The Meccano Motors and Steam Engine are strongly made and the utmost care is taken in their manufacture to ensure that they will give satisfaction. The side plates and bases are pierced with the standard Meccano equidistant holes, which enables a motor or engine to be built into any Meccano model in the exact position required.

Particulars and prices of the Steam Engine, Motors and Accessories are given below.

Meccano Clockwork Motor

This splendid Motor, which is specially designed for operating Meccano models, is a compact self-contained power unit.

An efficient governor controls the spring that is fitted on the motor and ensures a long steady run at each winding. Brake and reverse levers enable the motor to be stopped, started and reversed as required. Supplied complete with winding key and full instructions. Price **7/6**

Meccano Steam Engine

This is a particularly powerful steam unit designed for driving Meccano models. On actual test it has lifted over 56 lbs. A single cylinder of the oscillating type is employed, steam being admitted to it through a special reversing block. Operation of the reversing lever enables the crankshaft, which is fitted with a special compensating flywheel to run in either direction.

The spirit container for the lamp is placed well outside the boiler-casing, eliminating all risks of the spirit becoming heated. The boiler is fitted with an efficient spring safety valve of heavy gauge brass and there is no danger whatever of the boiler exploding. Price **25/-**

Meccano Electric Motor E.1 (6-volt)

This highly efficient electric motor (non-reversing) gives excellent service. A 6-volt Accumulator will operate it, but it may also be driven from the main (alternating current only) through the Transformer described in the next column. Price **7/6**

Meccano Electric Motor No. 6 (6-volt)

This 6-volt Motor is specially designed to build into Meccano models. It may be run from a 6-volt accumulator or, by employing the Transformer described below, from the main. It is fitted with reversing motion and provided with stopping and starting controls. The gearing is interchangeable. Price **15/6**

IMPORTANT.—Meccano 6-volt Motors will not run satisfactorily from dry cells.

Accumulator (6-volt, 20-amps)

The Meccano Accumulator is of substantial construction and is specially recommended for running the Meccano 6-volt Electric Motors. Price **28/6**

Transformer

By means of this transformer the Meccano 6-volt Electric Motors may be driven from the house supply (alternating current only). It is available for all standard supply voltages, from 100 to 250 inclusive, at all standard frequencies. The supply voltage and frequency must be specified when ordering. Complete with length of flex and adapter for connection to an ordinary lamp socket. Price **30/-**

Resistance Controller

By employing this variable resistance the speed of the Meccano 6-volt Electric Motors may be regulated as desired. The controller is connected in series with the motor and accumulator, or with the motor and transformer if a transformer is used as the source of power. It will not regulate the speed of a high-voltage motor connected to the main. **Price 4/6**

MECCANO LTD.

BINNS ROAD - OLD SWAN - LIVERPOOL

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